# Research about OpenXML, ODF & PDF

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# 1 Scope and summary

This report is the result of a preliminary research commissioned by the Danish National IT and Telecom Agency (ITST) and conducted by Ovitas AS Norway in 2006.

The purpose of this preliminary research is to establish whether the three document formats, OpenXML, ODF and PDF meet the following criteria for qualifying as candidates for open standards for document formats.

The criteria covered in this research include three main areas:

1. Openness (open documentation, rights, open interface, open meeting, consensus, due process)
2. Market issues (penetration, maturity, implementation)
3. Business potentials (functional and non-functional requirements, security, potentials and architecture)

The structure of this report is divided in a somewhat different way - as the description of the criteria has developed over time, but the covered issues are unchanged.

The main findings in the report are:

1. Openness:

All three standards are open and accessible for the public free of charge. The standards can be implemented by anyone, without any discrimination as open- or closed source applications on any platform.

- OpenXML is originally developed by Microsoft and submitted to the Ecma standardization process. Only companies can join Ecma. OpenXML cannot be considered as entirely open, as it is considered that Ecma does not work in an entirely transparent manner.
- ODF is based on the document format developed by OpenOffice.org and the standard was developed by OASIS. OASIS is considered to work in a highly transparent manner. ODF became a published ISO standard on November 30, 2006.
- PDF is created and controlled by Adobe Systems. There is no public information available on their internal routines. (Here we do not consider specialized subsets of PDF like PDF/A that has been adopted as an ISO-standard).

2. Market issues:

- OpenXML is not supported by any products yet (December 2006), but the document format is expected to gain widespread use as Microsoft has announced to use the format as the native format for their future Office product line. Microsoft's current market share of the office suite market is estimated to 90-95%.
- ODF is currently supported by a number of products and more product support is anticipated in the future. OpenDocument Fellowship claims OpenDocument has more than 12 % market share.
- PDF has about 15 years history on the market and has become a de facto global standard for fixed-layout documents. Readers for many platforms are available and are generally free.

3. Business potentials:

- OpenXML is an editorial format which supports rich functionality of the Microsoft Office suite, as it is a development of the internal document formats used in Microsoft Office including spreadsheets, presentations and drawings.
- ODF is an editorial format, which supports rich functionality for office users including spreadsheets, presentations and drawings.
- PDF is not intended to be used as an editorial format. PDF is used for representing documents in a device independent and resolution independent fixed-layout document format.

The conclusion of this preliminary research is that both OpenXML and ODF qualify as viable candidates for open standards for editorial document formats based on the criteria used in this research. PDF is currently controlled by Adobe Systems but has a unique worldwide take up.

After this preliminary research was carried out, a number of interesting developments have taken place. These developments are not reflected in this report. Three of these noteworthy developments are:

- Ecma has on 7 December 2006 approved Office Open XML as an Ecma standard and voted to submit the new standards to ISO for consideration as an ISO standard through the fast-track process.
- Adobe Systems has on 31 January 2007 announced that it intends to release the full Portable Document Format (PDF) 1.7 specification to AIIM, the Enterprise Content Management Association, for the purpose of publication by ISO.
- Microsoft has released Office 2007, which uses OpenXML as the default document format.

While it is too early to determine the results of these developments, this certainly accentuates the industry interest in support for open standards for document formats.

# 2 Standard

First, here it's a short description of each standard: history, origin and actual stage.

## 2.1 ODF

The ODF (OpenDocument) standard was developed by the *OASIS* industry consortium and based upon the *XML* format originally created by *OpenOffice.org*. More than 100 changes were made on the original schema, taking every participant's needs in account.

ODF was approved as an OASIS standard on *May 1, 2005* (by the whole full membership, which represents over 600 organizations). ODF became a published ISO and IEC International Standard referred to as ISO/IEC 26300:2006 on November 11, 2006.[1]

## 2.2 OpenXML

OpenXML is an open standard, originally developed by *Microsoft* and has submitted it to the *Ecma* standardization process. The charter of the *Ecma Technical Committee* requires it to submit the completed standard to the *ISO*. Ecma announced on *December 9, 2005* that it had accepted Microsoft's proposal to document the format as a proposed standard. It will be referred to as Ecma Office Open XML.

The final draft of the Office Open XML standard has been submitted it to the Ecma Secretary General (October 6th, 2006) and the General Assembly of Ecma International will vote on this proposal during their meeting December 7-8, 2006.[2]

## 2.3 PDF

PDF is an open file format created and controlled by *Adobe Systems*, for representing documents in a *device independent* and *resolution* independent fixed-layout document format.

Version 1.0 of PDF was announced at Comdex Fall in 1992. Version 1.6 was made available on November 2004.

# 3 Organization

This chapter is about the internal workflow, rules and control of the organization, responsible for the development of the standard.

Adobe is a private company. It's governed by rules and regulations related to private companies. There is no public information available on their internal routines.

## 3.1 Administration

*How the organization is governed*

### 3.1.1 OASIS (ODF)

The ODF standard is based on the document format developed by OpenOffice.org.

From OASIS' who page[3]:

*"OASIS (Organization for the Advancement of Structured Information Standards) is a not-for-profit, international consortium that drives the development, convergence, and adoption of e-business standards. The consortium produces more Web services standards than any other organization along with standards for security, e-business, and standardization efforts in the public sector and for application-specific markets. Founded in 1993, OASIS has more than 5,000 participants representing over 600 organizations and individual members in 100 countries."*

"Members of the OASIS Board of Directors are nominated in an open election process by the Sponsors and Contributors of the Consortium. Each director serves a two-year term."

Please read further details about the *open election process* here:

*http://www.oasis-open.org/who/election_process.php*

### 3.1.2 Ecma (OpenXML)

Ecma International is an industry association founded in 1961 and dedicated to the standardization of Information and Communication Technology (ICT) and Consumer Electronics (CE).

The organizational structure of Ecma is a simple, flat one: the technical work is done by the Technical Committees, and the results of this work can be submitted twice a year to the General Assembly for approval for publication.[4]

The General Assembly of the ordinary members is the highest authority of the Association. It controls the Association and appoints and controls its Management.

The Ecma procedures consist of a set of By-laws[5], Rules[6] and a Code of Conduct in Patent Matters[7].

## 3.2 Membership

*Rules and criteria for joining the organization.*

### 3.2.1 OASIS (ODF)

Anyone – company, organization or individual – can join to OASIS. Specialist, providers, implementers, users work on the standards.

See membership FAQ for details:

*http://www.oasis-open.org/join/membership_faq.php*

Members participated in the ODF standardization process, listed by Wikipedia[8]:

The standardization process included the vendors of office suites or related document systems, including (in alphabetical order):

- Adobe (Framemaker, Distiller)
- Arbortext (Arbortext Enterprise Publishing System)
- Ars Aperta
- Corel (WordPerfect)
- IBM (Lotus 1-2-3, Workplace)
- KDE (KOffice)
- SpeedLegal (SmartPrecedent enterprise document assembly system); both product and company later changed names to Exari.
- Sun Microsystems / OpenOffice.org (StarOffice/OpenOffice.org)

Document-using organizations who initiated or were involved in the standardization process included (alphabetically):

- Boeing
- CSW Informatics
- Drake Certivo
- Intel (they are developing sample documents as a test suite) (Bastian, 2005)
- National Archives of Australia
- New York State Office of the Attorney General
- Novell (Berlind, October 25, 2005)
- Society of Biblical Literature
- Sony
- Stellent

### 3.2.2 Ecma (OpenXML)

From *How to join Ecma*[9] :

- Companies which have interest and experience in matters related to one or more Technical Committees of the Association, and which wish to exert the right to vote at the General Assembly and to exert other exclusive rights defined in the By-laws and Rules can apply to become Ordinary members (full membership).
- Companies which have interest and experience in matters related to one or more of the Technical Committees of the Association but without the right to vote in the General Assembly can apply to become Associate members.

- Companies which have similar interests as an associate member and an annual, global turnover of less than one hundred million Swiss Francs can apply to become SME members (Small and Medium-sized Enterprise.

The Ecma technical committee developing the (OpenXML) proposal includes representatives from

- Apple
- The British Library
- Canon
- Intel
- Microsoft
- NextPage
- Novell
- Pioneer
- Statoil ASA
- Toshiba
- The United States Library of Congress.

## 3.3 Decision process

*How the organization develops and adopts a new standard.*

### 3.3.1 OASIS (ODF)

The elected board of the organization is not directly involved in the technical process of the standard development. The technical work around the standard is driven by the technical committees, which can be freely formed in the organization.

The board is responsible to supervise if the standard development goes according to OASIS' regulations. They also maintain and can revise *OASIS Open Bylaws*:

*http://www.oasis-open.org/who/bylaws/*

### 3.3.2 ECMA (OpenXML)

ECMA TCs develop standards. Their work can be submitted twice a year to the General Assembly for approval for publication.

Unless otherwise prescribed by these By-laws or the Rules of the Association, the vote of the majority of all the ordinary members shall decide any question.

### 3.3.3 Adobe (PDF)

PDF is the intellectual property of Adobe. Adobe alone decides about the development direction and speed. New versions are released rapidly. These new versions provide more and more functionality, but at the same time they bring possible incompatibilities also.

## 3.4 Openness

*How open are the processes, documentation, meetings etc. in the organization.*

### 3.4.1 OASIS (ODF)

*OASIS Policies and Procedures* are publicly available on the web site of OASIS:

*http://www.oasis-open.org/who/policies_procedures.php*

OASIS hosts a wide variety of email lists to enable and augment the work of Consortium members and encourage public input. Along with OASIS Standards and other approved documents, these email lists represent a vital community asset, a unique knowledge base produced through collaborative effort. With the conviction that access to information is the foundation of the open standards process, all OASIS email lists are archived online, and the vast majority are viewable by the public.[10]

### 3.4.2 Ecma (OpenXML)

Ecma does not operate in a transparent manner. They don't have publicly available mailing list or archive. Meeting minutes are not available for the public, neither the comments posted by the public.

## 3.5 Economic ground

*Ownership and other economic circumstances those are valid for the organization.*

### 3.5.1 OASIS (ODF)

OASIS is a non-profit organization, financed by sponsors.

Time and travel expenses are the responsibility of individual experts and their employers. The costs of phone and face-to-face meetings are covered by the sponsors.

### 3.5.2 Ecma (OpenXML)

Ecma is a non-profit-making organization. It devotes itself to no commercial activity.

It's financed based on membership fees, decided by the General Assembly with a two thirds majority of all ordinary members.

Ecma does not pay salary to TC members nor cover their expenses.

### 3.5.3 Adobe (PDF)

Adobe is a private company, founded in 1982. Adobe Systems entered *NASDAQ* in 1986. Adobe's 2005 revenues were about $2.0 billion USD. Today it has about 5879 employees worldwide.

# 4 Influence

*Control fulfillment.*

## 4.1 Openness - The technical committee

*A technical committee (TC) of an open community: Open standards are carefully monitored by a community that has the following characteristics.*

A TC is the group of all participants who are involved in the procreation and further development process of the standard. How the TC is founded and controlled has a major role in the standard creation process.

### 4.1.1 Membership

*All who are interested should be able to participate, without discrimination.*

#### 4.1.1.1 OASIS TC (ODF)

The OASIS' Technical Committees (TC) is self-organized. Three or more OASIS members can form a TC to standardize anything in the structured information field, without any formal approval by the board.

The **purpose of the OASIS OpenDocument Committee** is to "create an open, XML-based file format specification for office applications."[11] This means, the file format is not specialized for a certain application, but it provides a formal standard for arbitrary office applications. This includes Microsoft Office, but is not limited to it.

#### 4.1.1.2 Ecma TC (OpenXML)

TCs will be formed by the Secretary General (SG) when so decided at a General Assembly. Any proposal for the setting up of a TC must give the suggested terms of reference, including the scope, and be sent to the SG.

Any Ecma member may participate in any TC.

The **purpose of ECMA TC45** is "to produce a formal standard for office productivity applications that is fully compatible with the Office Open XML Formats, submitted by Microsoft".[12]

#### 4.1.1.3 Adobe (PDF)

There is no public information how working groups are formed at Adobe. Most likely it's driven by the company hierarchy.

### 4.1.2 Decision process

*Decisions are to be reached by consensus.*

#### 4.1.2.1 OASIS TC

OASIS has developed a strictly controlled, neutral process for developing new standards, named *OASIS Technical Committee Process:*

http://www.oasis-open.org/committees/process.php

http://www.xml.com/pub/a/2001/01/17/oasisprocess.html

Decisions are made via voting of the TC's members.

The voting details are available for the public:

http://www.oasis-open.org/committees/ballot.php?id=747

#### 4.1.2.2 Ecma TC

From the Ecma rules:

"Voting on any matter shall be by simple majority of TC members present at the meeting."

"It is recommended that in the course of its ordinary work the TC should not use voting unless it is impossible to make progress without a vote."

Conclusion made by the TC can be submitted twice a year to the General Assembly for approval for publication.

### 4.1.3 Transparency

*Policies and practice, notes and decisions of the community should be publicly available.*

#### 4.1.3.1 OASIS TC

The public can follow the work of the TC in great depth. They not only can access to this information, but also anyone can comment on this. The comments submitted by the public are also available for anyone to read. TCs actively use these public comments for their work.

OASIS ODF TC has 3 email lists:

- **Office** – used by TC members. The public can access the archive.
- **Office-comment** – a public mailing list for providing input to the TC members.
- **Opendocument-users** – a public mailing list for developers implementing the standard.

The OASIS TC also has an OpenDocument Wiki, which is a collaborative tool for the members. Only members can post to these pages, but anyone can read it.

http://wiki.oasis-open.org/office

Permanent work and stable artifacts will be moved to the document repository, where the archival work product of the TC also can be viewed by the public.

#### 4.1.3.2 Ecma TC

The TC's work is not transparent towards the public.

They publish a status report after each meeting, which are not very detailed and present the result, but don't say anything about the discussion itself:

http://www.ecma-international.org/memento/TC45-M.htm

It's also possible to submit a feedback, however these feedback are not publicly visible:

http://www.ecma-international.org/news/TC45_current_work/register2.php

#### 4.1.3.3 Adobe

Adobe provides *PDF Language and Specification forum*[13] as part of their *Adobe PDF Technology Center*.[14]

### 4.1.4 Availability

*Open standards are free for all to read and implement in a non-discriminating fashion.*

All of these three standards are open, accessible for the public for free of charge. These can be implemented by anyone, without any discrimination as open- or closed source applications on any platform.

### 4.1.5 Permissions

*The conditions of an open standard have to allow an extended or reduced implementation. In a given situation there might be a demand of communicating this clearly.*

#### *4.1.5.1 ODF*

ODF allows extensions. Documents conform to the ODF format, may contain foreign elements, elements not defined by the standard. These elements must use a foreign namespace.

The standard states one condition: the document must validate against the ODF schema after the foreign elements (extensions) are removed. Conformance (regarding to reduced implementation) is not defined further.

Applications can read and write the ODF format, may preserve the foreign elements, but it's not required.

ODF can also contain custom metadata (`<office:meta>`), which must be preserved.

For detailed information, please refer to section 1.5 (Document Processing and Conformance) in the standard.

#### *4.1.5.2 OpenXML*

A document conforms to the OpenXML standard if it's validating against the schema (excluding the extensions). An application conforms to the schema if it accepts all documents conform to the standard and if it produces documents conform to the standard.

Does it allow reduced implementation? Certainly. A conforming application must not reject any conforming documents, but it does not mean it has to do any meaningful with the content. It can be for example a simple validating parser.

The standard also defines interoperability guidelines:

"The application need not implement operations on all elements defined in this Standard. However, if it does implement an operation on a given element, then that operation should use semantics for that element that are consistent with this Standard."

Further readings: Conformance chapter in the Fundamentals.

The standard defines also extensibility in part 5, *Markup Compatibility and Extensibility*.

#### *4.1.5.3 PDF*

PDF does allow reduced implementation or extensions (for example using custom dictionaries) of the format. The implementation has to make a reasonable effort to respect the access permissions defined by the document.

# 5 Performance

*Comply with a generic demand.*

## 5.1 Maturity

Judging the maturity of a standard is a hard nut. We have to admit, this is not an ”exact science”. However looking into the history of the standard and the quality of the supporting application, we can draw quite an accurate picture.

### 5.1.1 Functional dimension

*To what extent does the standard cover its area of functionality (e.g. XML is 80% of SGML).*

#### 5.1.1.1 ODF & OpenXML

In functionality-wise both ODF and OpenXML formats satisfy the needs of sophisticated office applications. They express all commonly used office object types with advanced features. Beyond that they provide good accessibility and right management.

OpenXML made the goal to keep all the functionality of its preceding Microsoft document format.

ODF has strong roots also: it’s the descendant of the proven OpenOffice.org format, which has been used on the market for at least 5 years. The first work for the ODF file format started as early as 1999.

#### 5.1.1.2 PDF

PDF is derived from the very successful PostScript language. It has a long history, so it got long time to become mature... The first version came out in the early 1990s and the fifth edition was released about two years ago.

Along these years PDF became the de-facto standard on the fixed-layout document format market, winning over competing formats like Envoy, Common Ground Digital Paper or DjVu.

Today it’s widely used by the big publisher companies, which is the best proof of its maturity.

### 5.1.2 Testing - development period & successful implementation

*Tested in a technical implementation and/or been through several improvements/life cycles. Successful implementation in a sector, multi sector, public- and/or non-public sector*

#### 5.1.2.1 ODF

OpenDocument Format is currently used as the native file format in several office suites and individual applications. Support for OpenDocument was implemented independently, first in the KOffice suite and later in OpenOffice.org. Office suites which natively support OpenDocument Format are available on Windows, Mac OS X, GNU/Linux, Solaris, and Symbian OS.

The *ODF Test Suite*[15] is a publicly available interoperability test suite developed by Intel and the University of Central Florida. Automated results are available for interoperability testing of KOffice and OpenOffice.org.

The results are discussed and published on the opendocument-sample[16] email list.

The test results of the test suite related to OpenOffice and KOffice are published here:

*http://testsuite.opendocumentfellowship.org/summary.html*

#### 5.1.2.2 OpenXML

Microsoft Office 2007 will support the standard as its default format. This suite is not yet released, but expected about the end of this year (2006). The new Wordperfect (Corel software) will also support the OpenXML format, but its release date is unknown by now.

No publicly available interoperability test suite exists for Microsoft Office Open XML format. Since no currently released office suites provide native support for the format, it is not known to what extent documents saved in the Microsoft Office Open XML format will be properly formatted in other office suites.

#### 5.1.2.3 PDF

Adobe has a test suite with reference documents here:

*http://acroeng.adobe.com/*

The PDF specification also contains a few example documents.

## 5.2 Extensiveness

*Limited to developers/pilot projects and smaller/bigger groups or publicly available.*

### 5.2.1 Market share – current & previous version

#### 5.2.1.1 ODF

OpenDocument Fellowship claims OpenDocument has more than 12% market share. They have even higher figure related to the small and medium business.

When we sum different market share figures, we certainly end up with a number bigger than 100, which shows the reliability of the statistics.

The market situation may improve for ODF quite soon, since there are more and more efforts to adopt this standard. Governments are the biggest among them. This market share analysis provides a long list:

*http://wiki.services.openoffice.org/wiki/Market_Share_Analysis*

Major deployments:

http://wiki.services.openoffice.org/wiki/Major_OpenOffice.org_Deployments

There is an excellent article about the adoption of OpenDocument at Wikipedia:

http://en.wikipedia.org/wiki/OpenDocument_adoption

#### 5.2.1.2 OpenXML

Microsoft owns about 90-95% of the office suite software market. Since Microsoft made OpenXML (docx) the default format of its new Office 2007, the format will spread very fast as soon as this suite is released. End users will meet some problems, since former versions are not able to open docx. It can be fixed quickly via adding a plugin which can read and save documents in this new format.

The previous version of the format (Office 2003 XML) had about 8% market share. It was supported by MS Office 2003 only.

#### 5.2.1.3 PDF

PDF is the de-facto format, used basically everywhere. It's the default preview format on Macintosh, but there are free generators/viewers available for all the platforms.

PDF is the almost the only widely used page oriented document format on the market. Beyond that PostScript[17] is used quite a lot (which is also an Adobe standard), but it has less and less importance.

Important to note that Microsoft presented a similar fixed-layout document format named XML Paper Specification (XPS)[18] [19] in 2005. XPS is based on XAML, and is distributed along a royalty-free license. Microsoft is looking again at its license in order to make it compatible with open source licenses to make possible supporting this new format on other platforms also (like Linux or Mac OS).

XPS support is scheduled to be included in Microsoft Windows Vista. XPS can gain a good part of market share against PDF.

# 6 Agreement

*Fulfillment of specific eGovernment demands.*

## 6.1 Adequacy - Not functional – quality & limitations - Reference Architecture Customization

*In what scale the standard is in use/ is relevant in eGovernment (different platforms, OS and hardware).*

*In what scale can the standard be added and used in a reference architecture? A reference architecture describes an overall digital infrastructure.*

#### 6.1.1 ODF

Applications and platforms

There are sophisticated applications (both commercial and freeware) available for all the major platforms, including Windows, Linux, Mac OS, and Solaris... etc. We can say for all desktop hardwares.

ODF office suites are also localized for a vast number of languages[20] and use excellent language tools (spell checker, thesaurus...).

All parties, governments, companies or individuals can get the right level of support they depend on.

A disadvantage can be the missing mature light-weight viewer applications.

Migration of legacy documents

Data migration is most likely a very important issue here.

On demand conversion managed by the end user is not a commended way to address this issue, because any conversion on legacy formats will be lossy (at least on the layout). No doubt about that. However a do it once conversion, did by professionals, in a controlled way with review at the end can solve this problem.

Data flow

Light-weight viewer application can be used to read other formats.

Modifying documents arrived in other formats is a bit more difficult. Import filters, conversion does preserve the original text on a fairy reliable level, but the layout will most likely be a bit different.

### 6.1.2 OpenXML

Applications and platforms

Microsoft will release Office 2007 by end of this year, which will be the only application supports OpenXML for a while. The Mac OS platform will be supported in about a half a year. Other operation systems are not covered.

Corel promised to support the OpenXML format in the next release of WordPerfect.

There is no viewer application available for the format right now.

Data migration

Presumably, as soon as Microsoft releases Office 2007, the OpenXML format will spread very fast. However since other governments, companies or individuals are using or will be soon using the ODF formats, just using OpenXML would not eliminate data migration issues. They would be just the same as it's described above under the ODF section.

### 6.1.3 PDF

Applications and platforms

PDF has about 15 years history on the market. There are mature, free readers available for all platforms (operating systems & hardware). PDF also has available plug-ins for browser which makes it well integrated with the web. The end user can fill out a form online and submit it without leaving the browser or using directly the file system.

PDF authoring tools are very sophisticated, but also very expensive – used mainly by publication companies.

Freeware print drivers available to convert almost anything to PDF. Commercial PDF generators can make good quality, interactive PDF (table of content, indexes, links… etc) .

Data migration

Converting any editorial document format to PDF is fairly easy these days.

As soon as Microsoft will spread the XPS format (available in the Vista operating system), the convertibility will be an issue between these two formats. The discussion about this point is beyond the domain of this report.

## 6.2 Potential

*Potential of growth, may be spread out to other sectors.*

### 6.2.1 Use Cases

#### 6.2.1.1 Democracy Scenario

It's so apparent that electronic documents will be increasingly used between individuals and governments and between companies and governments. Democratic systems cannot allow locking public documents into proprietary formats or being dependent on one specific software vendor.

The government cannot push citizens to invest vendor specific applications by using a format with a single vendor.

To make sure public information is equally accessible for everyone, the government should not use document format, which requires specific applications to read or use what citizens cannot afford to purchase. Open source or at least free of charge software availability is preferred.

#### 6.2.1.2 Business Scenario

By using document format which is not vendor locked, the government would be able to choose between open source and different commercial solutions freely. It would lead to good competition between different software vendors, which will reduce the price of the different office suites. This price will be significantly lower than the premium price the government pays today.

By using open source technology, the government would be able to save huge amount of money in long term what was earlier spent on licenses, even changing the technical platform and train people is expensive.

#### 6.2.1.3 Technology Scenario

Only an open document format can ensure that a document will be readable after hundred years. Computer technology is changing lightning fast, in just a couple of years things can change dramatically. Contrarily with this speed, the government must keep public records in long term, in a readable form.

"Open Formats are specifications for data file formats based on an underlying open standard, developed by an open community, and affirmed by a standards body; or *de facto* format standards controlled by other entities that are fully documented and available for public use under perpetual, royalty-free, and nondiscriminatory terms."[21]

# 7 Specification on document formats

## 7.1 Readability, presentation, editing

*Is the format intended to be human readable? Is the format intended to use in editor tools by non-expert users?*

### 7.1.1 ODF

ODF uses XML syntax. The source format is very complex, not intended for the end users. However experts can read it directly for debugging, developing purposes.

Using editor tools, non-expert users can work with it in a convenient way.

### 7.1.2 OpenXML

OpenXML documents are native XML documents also, like ODF. The OpenXML markup is not a mixed content markup (as for example ODF is), which makes human readability worse.

The markup syntax is hidden from the end users. They get a user friendly WYSIWYG[22] editor.

### 7.1.3 PDF

PDF's source format is not a human readable. It uses proprietary syntax, embedding other formats, like XML, RDF, JavaScript… etc.

PDF is not intended to be used as an editorial format. It does not recognize paragraphs, indentations, formatting, headers, and footers. Expert users can add links or do small text changes in PDF.

For non-expert users it's recommended to use a (any) word processor and publish the content to PDF when it's done.

## 7.2 Exchange and integration

*Is the format intended to be used as an exchange format from machine to machine?*

We can generally say, all these three formats can be used as an exchange format, however all of them have different advantages, disadvantages. Let's check these out.

### 7.2.1 ODF

Pros:

- **Compact** – many content (XML) and multimedia files are packaged (by zip) into a single document
- **Small** document size – zip compressed
- **Editors** are available on most platforms – free, high quality editors
- Free **viewers** on most platforms
- Well-known **syntax** – easy to transform

- Built-in **right management**

Cons:

- Editors are not yet widely used
- Viewers are not yet mature

### 7.2.2 OpenXML

Pros:

- **Compact** – packed using the Open Packaging Conventions
- **Small** – zip archive
- **Microsoft Office 2007** will most likely be widely used
- Well-known **syntax** – easy to transform
- Built-in **right management**

Cons:

- Editors are not available on most platforms (only Windows and Mac will follow it soon)
- Free viewers are not available
- Some features are only available on Windows platform (for example: embedded OLE, VBA)

### 7.2.3 PDF

Pros:

- **Compact** – both text, multimedia and even fonts can be embedded
- **Small** – documents can be compressed
- Free, sophisticated **viewers** are available on **all platforms**
- Faithfully preserves **page layout**
- Built-in **right management**

Cons:

- Structure is not preserved, only layout
- Further editing is very limited
- Page optimized documents are difficult to render on smaller devices (like PDA)

## 7.3 Support of other standards

*Does the format support/use other standards?*

### 7.3.1 ODF

ODF is built using of these standards:

| Standard | organization | Description |
|---|---|---|
| XML | W3C | Extensible markup language |
| RelaxNG | OASIS, ISO | REgular LAnguage for XML Next Generation |
| XLink | W3C | Linking standard |
| XSL, XSL-FO | W3C | eXtensible Stylesheet Language |
| XForms | W3C | Web forms |
| SVG | W3C | Scalable Vector Graphics |
| SMIL 2.0 | W3C | Synchronized Multimedia Integration Language |
| DublinCore | NISO | Metadata element set, uses RDF (Resource Description Framework) |
| MathML | W3C | Mathematical Markup Language |

### 7.3.2 OpenXML

| standard | organization | description |
|---|---|---|
| XML | W3C | Extensible markup language |
| W3C XML Schema | W3C | XML Schema language |
| RelaxNG | OASIS, ISO | REgular LAnguage for XML Next Generation – an alternative way defining the structure |
| DublinCore | NISO | Metadata element set, uses RDF (Resource Description Framework) |

OpenXML uses **Vector Markup Language** (**VML**) to produce vector graphics. VML was submitted as a proposed standard to the *W3C* in *1998* by *Microsoft*, *Macromedia*, and others. VML was rejected as a web standard because *Adobe*, *Sun*, and others submitted a competing proposal known as *PGML*. The two standards were joined and improved upon to create *SVG*[23].

### 7.3.3 PDF

| standard | organization | description |
|---|---|---|
| XMP[24] | Adobe | PDF may contain metadata streams described as XMP. XMP is based on DublinCore[25] (RDF[26], XML, …) |
| JPEG, JPEG2000 | ISO, ITU-T | Compression of color and grayscale images. |
| JBIG2 | ISO, ITU-T | compression of monochrome images |

| | | |
|---|---|---|
| SVG | W3C | Scalable Vector Graphics |

## 7.4 How applicable is the standard for other standards?

*Does the format/standard comply with the most widely known and accepted norms of quality when it is in use by other standards? I.e. XSLT is often used to transform XML based formats to other formats.*

### 7.4.1 ODF

ODF is built on using many well known standards. It makes possible to build applications which reuse existing modules, libraries implement these "built-in" standards.

ODF is XML and XML Namespace aware, so it's possible to parse, validate and serialize with proven XML tools on any platform.

XSLT suits well to transform the content. XSL-FO can be used to generate a PDF representation.

ODF uses zip for packaging the XML fragments.

### 7.4.2 OpenXML

OpenXML is an XML markup with namespace support. Because of this fact, it has the same processing benefits as described above related to ODF.

The ODF Converter, which is a plugin (under development) for Microsoft Office 2007 is able to open and save ODF documents, implemented using XSLT technology.

An OpenXML document can store information about an XSL Transformation which might be applied on save.

OpenXML defines the Open Packaging Conventions. It's a set of XML files, packed as a zip document.

Beyond XML, OpenXML does not use many other open standards, but instead implements features from scratch.

### 7.4.3 PDF

PDF is built in a proprietary fashion from the bottom, using unique syntax and structure, so PDF processors has to be special also. However it can embed objects defined by other standards, like

- XML fragments
- Metadata descriptor – RDF (XML)
- JavaScript
- Pictures
- Fonts

## 7.5 Document types

*Does the format support the most known document types? Which ones? (I.e. presentations, spread sheets etc.)*

### 7.5.1 ODF

Yes, ODF covers all the most common document types. Defined ones:

- Text
- Drawing
- Presentation
- Spreadsheet
- Chart
- Image

### 7.5.2 OpenXML

OpenXML implements the same set of document types what ODF does (see above). It uses the next markup languages to implement these types:

- WordProcessingML
- SpreadsheetML
- PresentationML
- DrawingML
- VML

### 7.5.3 PDF

PDF does not define document types. It's not an editorial, but a page oriented representation format.

Content elements:

- Text
- Vector graphics
- Raster graphics

## 7.6 Support user annotation

*Does the format allow a user to utilize its own annotation of the document structure?*

### 7.6.1 ODF

The ODF standard defines annotation functionality. An annotation can contain text paragraphs, lists an it has metadata like creator, creation time… etc.

The user can also create *notes*, which are numbered annotations, like footnotes. ODF has review function, it can record and display changes.

For technical details, read sections 12.1 & 5.3 of the standard.

### 7.6.2 OpenXML

OpenXML allows 3 different types of annotations:

- Inline: bound to a specific text location.
- Cross structure: they may span parts of multiple paragraphs.
- Property: annotation is stored as a property on an object, like paragraphs, table rows… etc.

Comments are cross structure annotations, which are anchored to a region of document content, but the text of the comments is stored in a separate comments part of the document package.

Read the standard text, section 2.13.

### 7.6.3 PDF

The PDF specification says:

"…a PDF document can contain interactive elements that are possible only in an electronic representation.

PDF supports annotations of many kinds for such things as text notes, hypertext links, markup, file attachments, sounds, and movies. A document can define its own user interface; keyboard and mouse input can trigger actions that are specified by PDF objects. The document can contain interactive form fields to be filled in by the user, and can export the values of these fields to or import them from other applications."

If these functions have been rights-enabled by the PDF author, the user can annotate the document using the freeware Adobe Reader for example.

## 7.7 Documentation and specification

*Is the format well documented and the specification well structured and understandable?*

### 7.7.1 ODF

OASIS ODF v1.0 standard:

*http://www.oasis-open.org/specs/index.php#opendocumentv1.0*

*http://std.dkuug.dk/keld/iso26300-odf/*

The specification is well structured, understandable and available for the public.

A short description at Wikipedia:

*http://en.wikipedia.org/wiki/OpenDocument_technical_specification*

### 7.7.2 OpenXML

Ecma Office Open XML File Formats Standard - Final draft - 9th of October 2006:

*http://www.ecma-international.org/news/TC45_current_work/TC45-2006-50_final_draft.htm*

The standard is modular, split to well defined parts as:

1. Fundamentals
2. Open packaging conventions
3. Primer
4. Markup language reference
5. Markup compatibility and extensibility

All together it's about 6000 pages, complex, but well-constructed and understandable.

### 7.7.3 PDF

The PDF specification is publicly available here:

*http://partners.adobe.com/public/developer/pdf/index_reference.html*

It's a huge document, more than 1200 pages. It requires quite a huge effort to study, but it's extremely well structured, clearly expressed and understandable.

## 7.8 Technical references

*Are there other technical references and articles available on the format? What and where?*

### 7.8.1 ODF

This Wikipedia article can be used as a starting point:

*http://en.wikipedia.org/wiki/OpenDocument*

Online community site:

*http://opendocument.xml.org/*

*http://www.odfalliance.org/*

Why ODF? - The Importance of OpenDocument Format for Governments:

*http://opendocument.xml.org/node/140*

Open-standards solutions White Paper: Emerging business value of OpenDocument format v1.0, IBM, January 2006.:

*http://odfalliance.org/pubs/ODF_WP_Jan_05.pdf*

Is ODF an Open Standard?:

*http://www.groklaw.net/article.php?story=20060209093903413*

### 7.8.2 OpenXML

Again, Wikipedia is good to start with:

*http://en.wikipedia.org/wiki/Microsoft_Office_Open_XML*

Ecma Office Open XML Formats overview:

*http://office.microsoft.com/en-us/products/HA102058151033.aspx*

Ecma International standardization of OpenXML file formats frequently asked questions:

*http://office.microsoft.com/en-us/products/HA102057901033.aspx*

Technical forum:

*http://openxmldeveloper.org/*

### 7.8.3 PDF

An excellent introduction of PDF is given by the PDF primer white paper:

*http://www.pdf-tools.com/public/downloads/whitepapers/whitepaper-pdfprimer.pdf*

Wikipedia has an article with many good references:

*http://en.wikipedia.org/wiki/PDF*

## 7.9 Adoption and/or support of other document formats

*Does the format support other standards for document formats? Which ones?*

This section is about if the standards are maintaining interoperability with other standards, previous versions or ancestor of the standard. It's not about if the standard makes use of or built on top of other standards. That's already covered in section 7.3.

### 7.9.1 ODF

The ODF standard is used the OpenOffice.org format as a starting point, but it had the primary aim to develop an application and platform independent document format. It targeted to cover all the functionality demanded by the whole community (including also Microsoft Office users).

ODF does not support the OpenOffice.org format as standard. Of course end users get the application level support for this legacy format. OpenOffice users can load and save documents using this format, but ODF is the default format for the application.

### 7.9.2 OpenXML

OpenXML is the direct descendant of the Office XML 2003 which was used in Microsoft Office 2003, however Microsoft decided not to support this previous format.

OpenXML has the aim to be 100% compatible with the old proprietary binary document format, to enable lossless conversion between them. Certainly OpenXML is not backward compatible with the binary format, since for example they use different syntaxes, but on the functional level, yes it's backward compatible.

### 7.9.3 PDF

PDF does not support other document formats, except it maintains a certain level of compatibility with its older versions.

Please refer to appendix H.2 of the standard about feature compatibility between different versions.

## 7.10 Application support

**Status of the product:**

★ Work has started.
★★ Has important limitations.
★★★ Generally works, but there are missing features.
★★★★ Works well even on complex documents.
★★★★★ Perfect support.

### 7.10.1 ODF

The web resource *Application support for the OpenDocument format*[27] is used from the OpenDocument Fellowship. Only applications using ODF as native format are listed.

#### 7.10.1.1 Viewer

| Application | Status | Used in the public sector | Export | Platform | Comments |
|---|---|---|---|---|---|
| Fellowship ODF Viewer[28] | ★★★ | No | - | Windows, Linux, Mac | |
| TextMaker ODF viewer[29] | ★★★ | No | - | Windows | Supports other formats as well: Microsoft Word, TextMaker, OpenOffice.org (sxw), RTF, Pocket Word, Pocket Word, HTML, text |
| Firefox ODF plugin[30] | ★★★ | | - | Windows, Linux, Mac | |
| Visioo Writer[31] | ★★ | | - | Windows, Linux | |

#### 7.10.1.2 Editor

| Application | Status | Used in the public sector | Import | Export | Platform | Comments, advantages |
|---|---|---|---|---|---|---|
| OpenOffice.org[32] | ★★★★ | Attracts more and more users | | PDF, LaTex | Windows, Linux, Mac | ODF is the native format since version 2.0. |
| StarOffice[33] | ★★★★ | Yes[34] | | | Windows, Linux | Based on OpenOffice.org |

| | | | | | | |
|---|---|---|---|---|---|---|
| KOffice[35] | ★★★★ | | | | Linux, Unix | KOffice is not derived from the OpenOffice.org code base. |
| Workplace[36] | ★★★ | | | | Windows, Linux | Based on OpenOffice.org, OpenDocument support is developed independently. |
| Mobile Office | ★★★ | | | | Symbian | |
| Writely[37] | ★★★ | No | | | Windows, Linux, Mac | Web based editor. Files size is limited to 500KB. Does not support OpenDocument Text Template format. |

#### 7.10.1.3 Conversion tool

| Application | Status | Format | Platform | Comments |
|---|---|---|---|---|
| ODF Tools[38] | ★★★ | Ods, odt, xhtml | Linux | Reusable XSLTs. |
| 3BOpenDoc[39] | ★★★★ | ODF, Microsoft Office (doc, xls, ppt), SWX, PDF, Secure PDF, RTF, Text, HTML, PNG and JPEG, FLASH | Windows, Linux | Server based solution, can be integrated into intranets. |
| Docvert[40] | ★★★★ | MS Word, ODF, DocBook, HTML, WMF, SVG | Windows, Linux | Only converts text documents. |
| Xena[41] | ★★★★ | Microsoft Office documents | Any (Java) | |

### 7.10.2 OpenXML

#### 7.10.2.1 Viewer

As it's today, there is no OpenXML (docx) viewer available. Microsoft used to make freeware viewers[42] available for Word, Excel, PowerPoint and Visio. Word Viewer 2003[43] is not able to open docx files.

#### 7.10.2.2 Editor

| Application | Status | Used in the public sector | Import/ Export | Platform | Comments, advantages |
|---|---|---|---|---|---|
| Microsoft Office 2007[44] | ★★★★ | Yes | Html, Rtf, WordPerfect, Works, PDF (via plugin), XPS[45] (via plugin) | Windows, Mac version is expected around sept. 2007 | OpenXML is the native format. |
| Gnumeric[46] | ★★ | | Applix, DIF, Excel, Html, LaTex, Lotus 1-2-3, MultiPlan, GNU Oleo, OpenDocument, OpenOffice.org 1.x, Quattro Pro, SpreadsheetML, Xspread and Xbase | Linux, Windows | Spreadsheet application |

OpenOffice.org already supports the predecessor of the OpenXML word processing format namely *WordProcessingML 2003*. Corel has already indicated its *Wordperfect Office* suite will also support OpenXML[47].

#### 7.10.2.3 Conversion tool

| Application | Status | Format | Platform | Comments |
|---|---|---|---|---|
| 2007 Microsoft Office Add-in: Save as PDF or XPS | ★★★★ | PDF, XPS | Windows | Because of legal issues, Microsoft Office 2007 cannot publish natively to PDF[48]. |
| Microsoft Office 2007 compatibility pack | Pre release | docx | Windows | Open, edit, save, and create files in OpenXML (docx) file formats in Microsoft Office 2000, Office XP, and Office 2003. |
| ODF Converter[49] | ★★ | ODF | Windows | Add-in to Microsoft Word 2007 to allow opening and saving OpenDocument format (ODF) files.<br>Microsoft finances an open-source (BSD license) project on sourceforge.net to create a plugin for MS Office.<br>The project plans to release the first version by end of 2006 for *Microsoft Word*. Support for *Microsoft Excel* and *Microsoft PowerPoint* will be added in 2007.<br>Be aware! There are OpenXML features which are not supported by ODF and visa versa. The conversion can loose information. |

### 7.10.3 PDF

#### 7.10.3.1 Viewer

PDF viewers are available for almost all operating system for free of charge. PDF interpreters are ported to many platforms. Many different GUIs are available using the same backend. The software list below is far not complete, but contains the most important applications.

| Application | Status | Used in the public sector | Export | Platform | Comments |
|---|---|---|---|---|---|
| Adobe Reader[50] | ★★★★★ | Yes | text | Windows, Linux, Mac, Plam, Pocekt PC, Symbian | Feature rich, many plug-ins. |
| Foxit Reader[51] | ★★★★★ | | text | Windows, Windows Mobile, Windows CE, Embedded Linux | Very fast and small. |
| Brava Reader[52] | ★★★ | | Jpeg | Windows | Views also TIFF & CSF. Only page thumbnails, but no table of content. |
| Evince[53] | ★★★★★ | | | Linux GNOME | Fast, easy navigation, effective search. |
| GSView[54] | ★★★ | | | Windows, OS/2, Linux | Based on GhostScript. No bookmarks available. |
| GhostView[55] | ★★★★ | | | Unix/X11 | Based on GhostScript |
| Xpdf[56] | ★★★ | | | Unix/Linux, BEOS, RISC OS, Palm OS | Weak graphical user interface. |
| PDF+[57] | ★★ | | | Symbian OS | |
| Browser plugin | ★★★★ | | | Firefox, Internet Explorer... | |

#### 7.10.3.2 Print drivers

Using a PDF print driver is the easiest way to generate a PDF document from any document viewer/editor with print capability.

| Application | Status | Platform | Comments |
|---|---|---|---|
| Adobe Distiller[58] | ★★★★★ | Windows, Unix, Sun Solaris | Replaced by Adobe Lifecycle PDF Generator[59]. |
| PDFCreator[60] | ★★★★ | Windows | Does not generate interactive PDF. |
| PrimoPDF[61] | ★★★★ | Windows | |
| CUPS[62] | ★★★★ | Linux/Unix | Common UNIX Print System |
| Mac Preview[63] | ★★★★★ | Mac OS | Available from all document viewers. |
| JAWS PDF creator[64] | ★★★★★ | Windows, Mac | Creates interactive PDF (TOC, links…), optimizes to print or web. |

#### 7.10.3.3 Editor

PDF is not and editorial but rather a representation format. It does not have a concept for paragraph, formatting, headers, footers, indentations, line-breaks, etc. It cannot be authored via normal word processing. However it can be manipulated many ways, like merging, splitting documents, encrypt, decrypt, adding indexes, maintaining bookmarks… etc.

| Application | Status | Used in the public sector | Export | Platform | Comments, advantages |
|---|---|---|---|---|---|
| Adobe Acrobat[65] | ★★★★★ | Yes | HTML, XML, text, EPS, MS Word | Windows, Mac OS | Adobe Acrobat is not an authoring application.[66] |
| NITRO PDF[67] | ★★★★ | Yes | MS Word | Windows | Fast document processing. |
| JAWS PDF Editor[68] | ★★★★ | Yes | | Windows | |
| ScanSoft PDFConverter[69] | ★★★★ | | MS Office, WordPerfect | Windows | Text-to-Speech Capability |
| PDFFactory[70] | ★★★ | | | Windows | |
| VeryPDF PDF Editor[71] | ★★★ | | Image file | Windows | |
| PDFMeld[72] | ★★★ | | | Windows, Linux, FreeBSD, MAC, AIX, HP-UX, SCO SV, Sun Solaris | |
| pdftk[73] | ★★★ | | | Windows, Linux, Max, Solaris, FreeBSD | Free software (GPL) |

#### 7.10.3.4 Conversion tool

As mentioned above PDF does not recognize paragraphs, headers, footers… etc, which makes very difficult to turn a PDF document to a word processing format. Doing it so is not problem free.

| Application | Status | Format | Platform | Comments |
|---|---|---|---|---|
| GhostScript[74] | ★★★ | | Windows, Mac, Linux, OS/2 | Postscript & PDF interpreter. |
| LIT PDF2everything[75] | ★★★ | PowerPoint, PS, EPS, BMP, PNG, TIF, JPEG, PCX | Windows | Based on GhostScript. |
| VeryPDF conversion tools[76] | ★★★ | Word, text, HTML, | Windows | |

# 8 Law and rights

## 8.1 What license related rights are affiliated with the standard?

### 8.1.1 ODF

From the OASIS ODF FAQ[77]:

"OpenDocument is royalty-free. It can be used without charge by anyone."

"The OpenDocument format is owned by OASIS, a non-profit consortium dedicated to the open development of public XML standards. The standard is maintained by the OASIS OpenDocument Technical Committee, which is made up of XML, document management, and office application experts."

### 8.1.2 OpenXML

OpenXML is an open standard. No license is needed to use the OpenXML format. It can be freely implemented by multiple applications on multiple platforms. It also permits open source implementation.

From the paper *Ecma International standardization of OpenXML file formats frequently asked questions*[78]*:*

"… intellectual property in the OpenXML document formats would be available freely, now and forever"

"We eliminated the license to patents language and are instead providing an irrevocable commitment to not sue anyone based on the patents we have in the formats. If any parties prefer, we will make available the existing open and royalty free license as an alternative."

"Anyone is free to work with a subset of the specifications, and anyone is free to create extensions to the specifications… The key is that this is an assurance that no one will be sued for using intellectual property in the specifications as they are written. "

In other words, Microsoft applies the 'Covenant Not to Sue' (CNS) approach for the license.

Further readings:

Top open source lawyer blesses new terms on Microsoft's XML file format:

*http://blogs.zdnet.com/BTL/index.php?p=2192*

Brian Jones' blog about Open XML Formats:

*http://blogs.msdn.com/brian_jones/archive/2006/08/04/688932.aspx*

#### 8.1.3 PDF

Adobe has copyright on the PDF standard. Adobe gives permission to anyone to create PDF files, write print drivers, software which interprets the content. The author of such software must respect the access permissions described by the format and must include an appropriate copyright notice.

See the section 1.5 of the standard for details.

## 8.2 Are rights other than those related to licensing affiliated with the standard? Which?

We also have to check if the standards are bound to specific platforms or proprietary technologies.

#### 8.2.1 ODF

ODF is built on top of well known, widely used open standards. It does not re-invent the wheel, which makes it more transparent and easier to use for developers. It does not use proprietary technology and completely open.

#### 8.2.2 OpenXML

OpenXML uses Microsoft's technology, like ActiveX[79] (OLE) or Visual Basic for Applications[80] (VBA) which are bound to the Windows platform. VBA is proprietary to Microsoft and is not an open standard.

#### 8.2.3 PDF

PDF might refer to fonts which are not free of charge or not available on every platform.

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