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Addressing **lock-in**, **interoperability** and **longevity** of software systems through sustainable **open source** modelling tools

Presentation:

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@

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Projects and experiences include ...

- EU FP6 **CALIBRE** (2004-2006)
- ITEA **COSI** (2006-2009)
- **Open Source Action** (2008-2010)
- ITEA2 **OPEES** (2009-2012)
- **OSS Researchers Network** (2009-2012)
- Management and organisation of open practices (2011-2013)
- **ORIOS** – *Open standards* (2012-2015)
- EU FP7 **PREFORMA** (2014-2017)
- SIC @ Kammarkollegiet – *Open standards* (2015)
- Swedish Competition Authority – *Standards & lock-in* (2015-2016)
- EU **CISOSS** – *Cloud & open source for SMEs* (2016-2017)
- **LIM-IT** – Open Source in company contexts (2016-2020)
- *...*

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Open Source Software (OSS) ...

- Open Source Software is software made available under a software license which has been approved by the Open Source Initiative (OSI), see further: www.opensource.org

www.opensource.org/licenses

- “The Open Source Initiative (OSI) is a non-profit corporation with global scope formed to educate about and advocate for the benefits of open source and to build bridges among different constituencies in the open source community.”

www.opensource.org

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Acknowledgements: The LIM-IT project ...

- "The overarching goal of LIM-IT is to develop, use, and scrutinise effective work practices and strategies for development, procurement, and organisational implementation of software systems in a number of complex application domains, where such software systems with associated digital assets typically involve several **open source projects** (as well as proprietary software), often depending on many different legacy systems."
- "Three fundamental challenges related to different types of **lock-in effects**, different **interoperability issues**, and **long-term maintenance scenarios** are addressed by the LIM-IT project." (http://www.his.se/lim-it/)

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*Background: Several **challenges** concern software and file format standards ...*

- Organisations **use** many **different applications** and **file formats**
- Organisations often need to **preserve** and **modify** their **software systems** and **digital assets** (e.g. UML models and other assets) for **more than 30 years**, sometimes even more than 70 years
- **Maintenance** and support contracts **for proprietary licensed** software are provided for (up to) **10 years**
- **Digital assets** (files) **outlive proprietary software** in any maintenance scenario (from this it follows that **we need Open Source Software**, OSS)
- **Software** used for the initial creation of digital assets **will not be available** during the complete life-cycle for many systems (for companies and public sector organisations)

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Longevity?

78 ...

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Longevity of hardware and software ...

1978 ...

… 'Monty' develops MySQL → MySQL AB established 1995 → MySQL goes GPL 2000 → SUN acquires MySQL AB 2008 → Oracle acquires SUN 2009 → … Oracle becomes a major copyright holder of GPL-code ...

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Longevity of systems ...

78 years ...

… Airbus A300 life-cycle …
Program began 1972,
production stopped in 2007,
Support will last until 2050 ...

By Lars Söderström [GFDL (http://www.gnu.org/copyleft/fdl.html), GFDL (http://www.gnu.org/copyleft/fdl.html) or CC-BY-SA-3.0 (http://creativecommons.org/licenses/by-sa/3.0/)], via Wikimedia Commons

Early UML tools becoming open source projects ...

- ArgoUML started life in 1995 as a university research project by Jason Robbins
- The main goal of the Argo project was to develop the modelling tool ArgoUML
- Argo was made publicly available in the middle of 1998 and turned into an open-source project in the beginning of 1999.

(Persson et al., 2005, p. 88)

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Conceptions of Open Source tools ...

- "Open-source software encourages data sharing, and is a good way of sharing work. However, large commercial organizations need the support infrastructure provided by vendors, albeit committing to proprietary technologies." (Gray et al., 2000, p. 75)
- "**Open Source UML modelling tools** are also **not currently considered to have sufficient quality** to fulfil the requirements of the software company for complete code generation using Model Driven Development. In some cases the desired features were not supported, and in other cases the general quality of the tools was poor." (Lundell et al., 2011)
- "Lack of long-term support from proprietary suppliers and risk of **lock-in** is a driver for Open Source adoption" (Lundell et al., 2011)

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Ten Myths about Open Source Software (OSS) Myth #2 – OSS isn't reliable or supported

- "If open source software isn't **reliable** enough to use, then the Internet isn't reliable enough, because the Internet infrastructure relies"
- Open Source "represents a **huge shift of power** from vendors to end users, who are not left without recourse if the original developer abandons the marketplace."
- "With the growing interest in open source software in the computer industry, large end users will soon have **the best of both worlds**, with the informal **support** mechanisms of the networked developer community with the big-company support"

–'Ten Myths about Open Source Software', talk given by Tim O'Reilly to a group of Fortune 500 executives, October 1999.

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On the value of Open Source ...

- "The overall contribution of OSS to Europe's economy has been calculated to be almost €450 billion."

Denislava Simeonova, "Digital Solutions: Can we 'Open Source' the Future?", DG Digit, European Commission, Commission en direct #21

€450 billion

- *This is approximately the same as 5 times the total income for the Swedish state for 2015 (854.000.000.000 SEK).*

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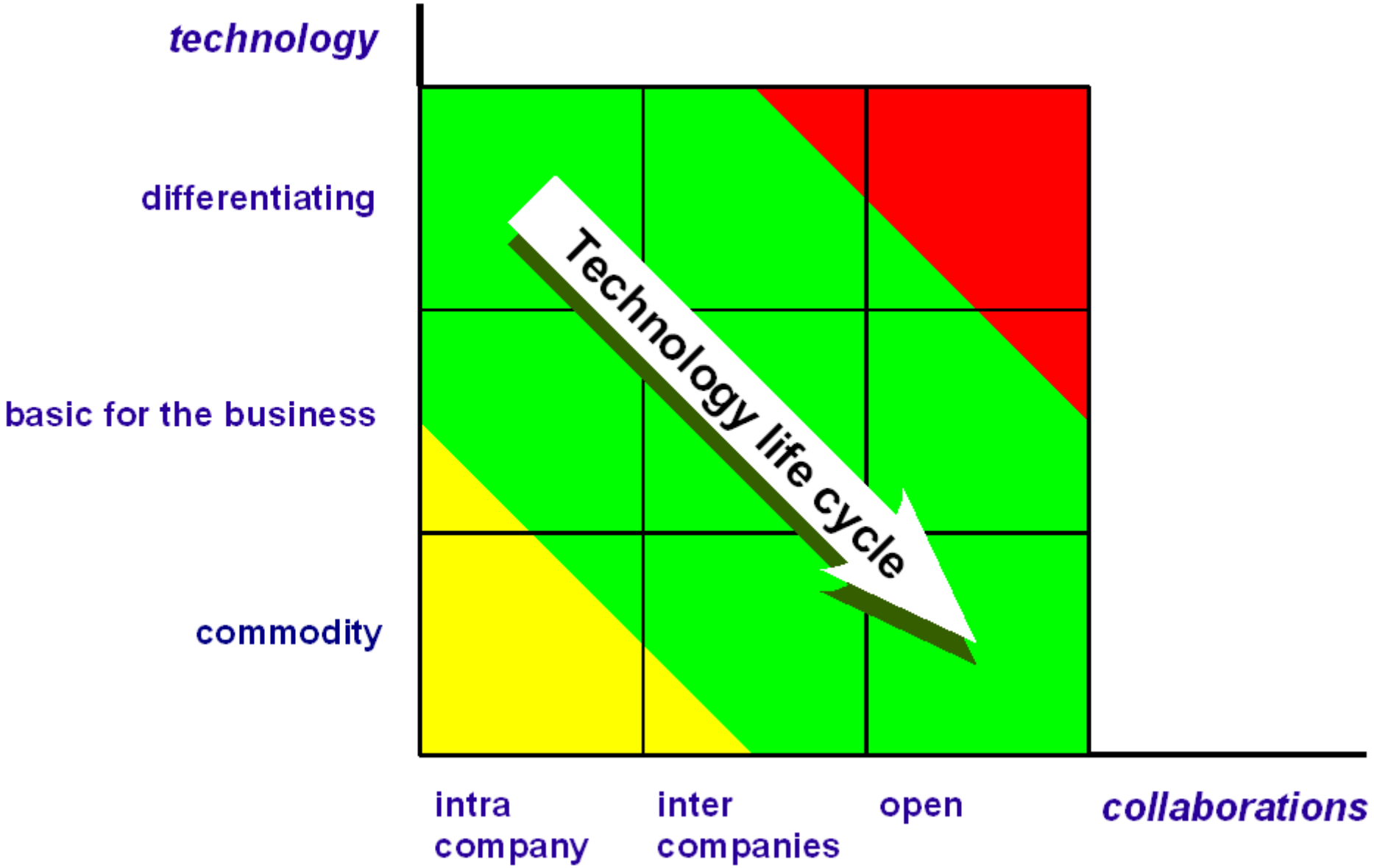
Commodification of software & OSS

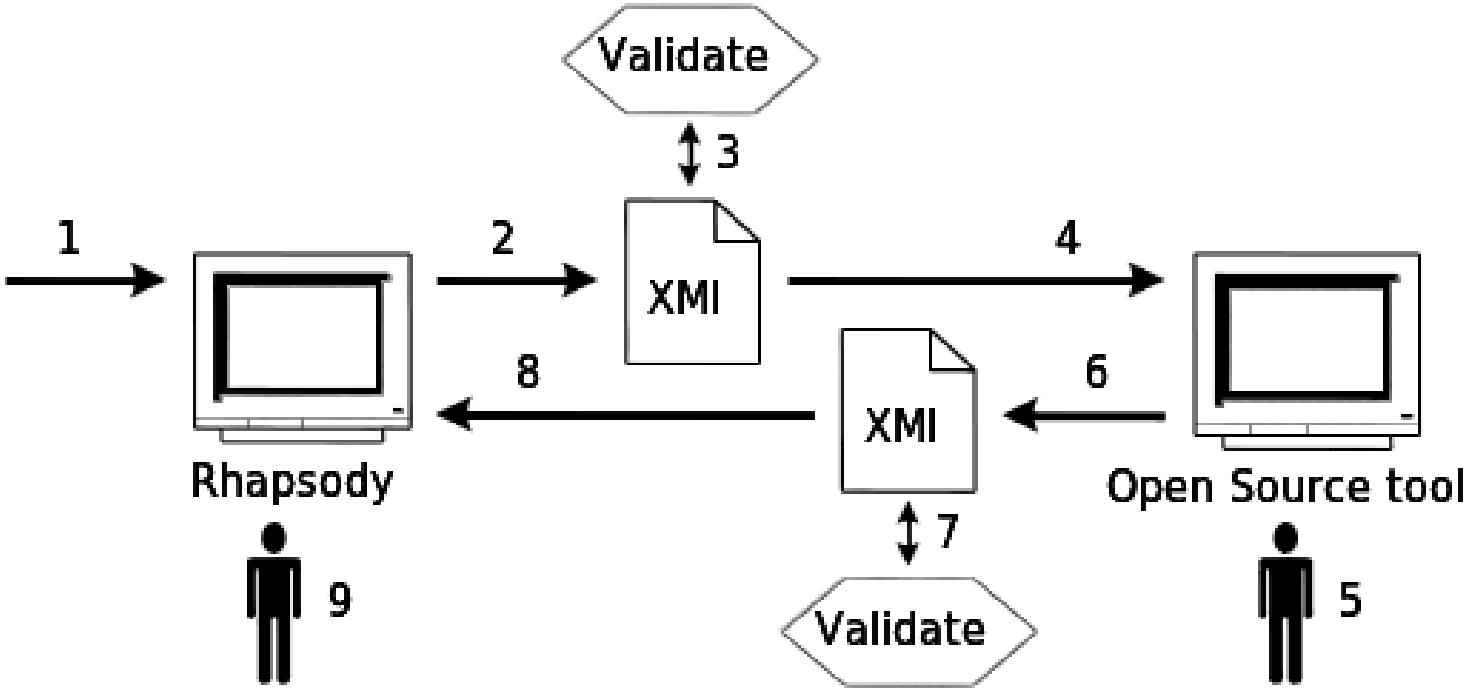
*Knowing **what** to make open **when** ...*



Lundell & van der Linden (2012) Open Source Software as Open Innovation: Experiences from the Medical Domain, In Managing Open Innovation Technologies, Springer.

UML tools and model lock-in ...

Can model interchange (interoperability) be achieved?



- Two production models (consisting of approximately 170 and 60 classes) developed by Combitech (in different versions of Rhapsody, Ver 3.x and Ver 4.x) were used in the study.
- The study found that problems exist with interchange and that "the technology needs to mature before industrial-strength model interchange becomes a reality" (Persson et al., 2006)

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UML tools and interoperability (1/2) ...

Can model interchange between tools be achieved?

- "Interchange of a model between two tools is said to be successful if all model information other than presentation information is preserved during the transfer."
- "Versions of XMI earlier than 2.0 do not cater for the exchange of presentation information, so **layout aspects** are therefore **lost** at interchange. In practice, this is a significant problem where there is subsequent human interaction with the model, but of less significance for functions such as code generation."
- We were "**unable to find any combination of tools which successfully interchanged model information** between them. Our findings suggest that a strategy for a company working in the context of embedded systems design cannot currently rely on standardised model interchange between different UML modelling tools." (Persson et al., 2005)

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UML tools *and* ***interoperability*** *(2/2) ...*

Can model interchange between tools be achieved?

- "The success of interchange between all of the tools using XMI 2.0 is a major improvement on experiences with tools using earlier versions of XMI. From the perspective of tool interoperability **things have improved significantly**."
- "it is of concern that the two tools utilising XMI 2.1 fail to interchange data with any of the tools supporting XMI 2.0."
- "**Weakly supported backward compatibility of XMI versions** is a **cause for continuing concern about tool lock-in**. From the perspective of protecting investment in models, extra tool support is needed beyond that offered by modelling tools themselves."

(Lundell et al., 2006)

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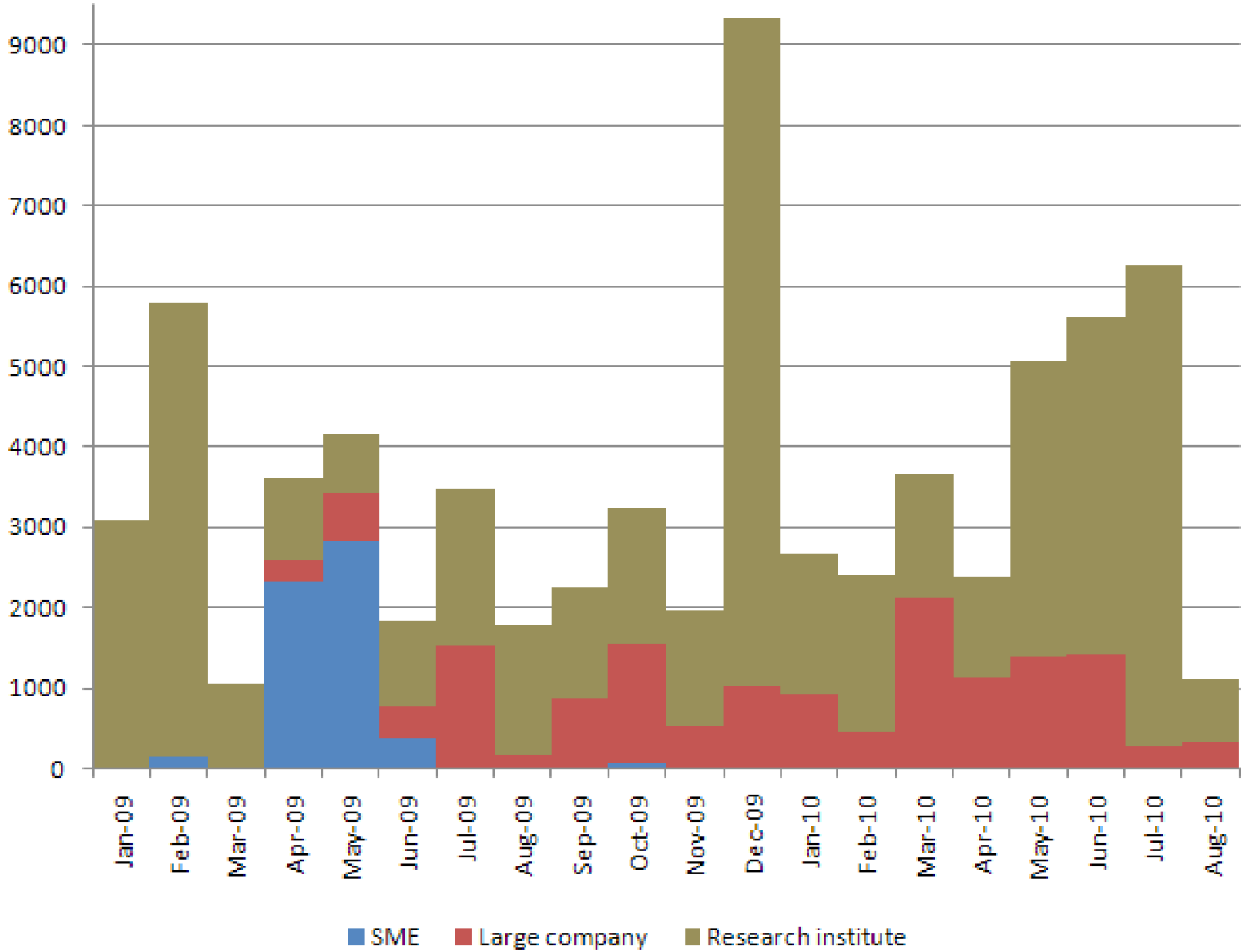
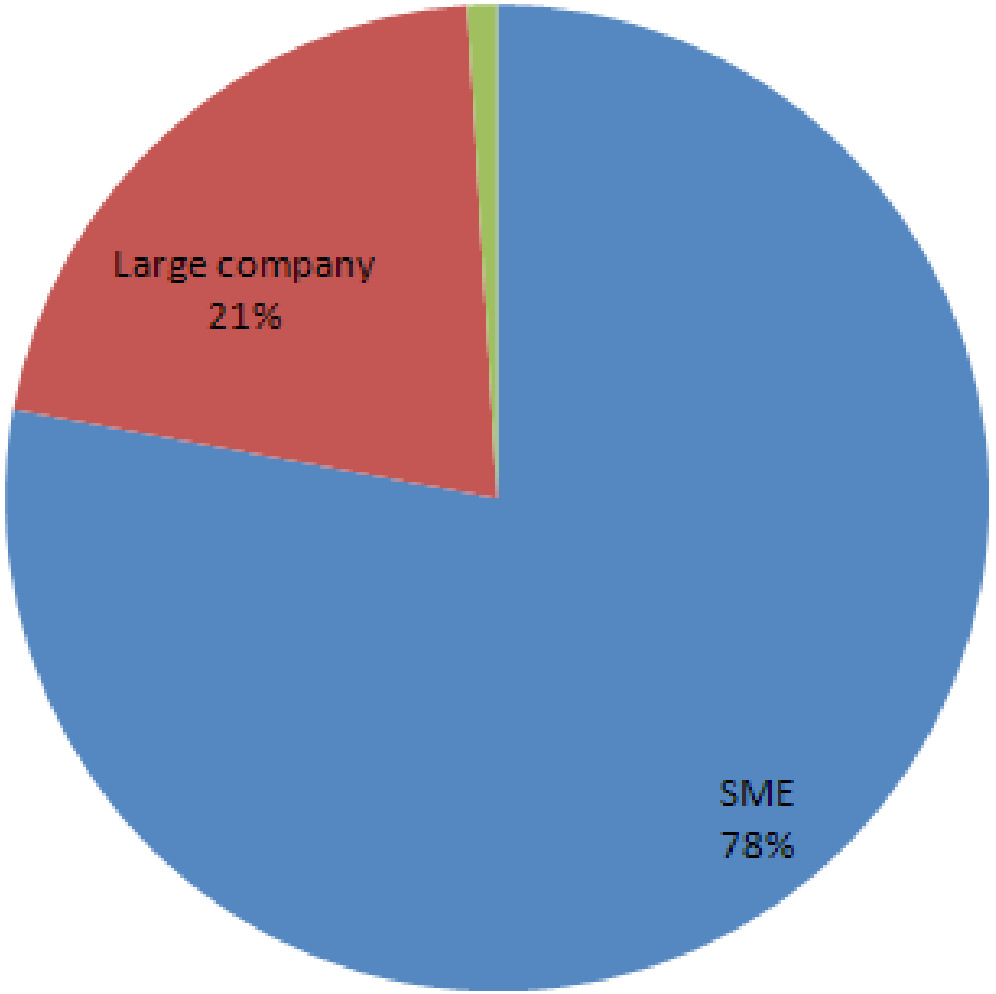
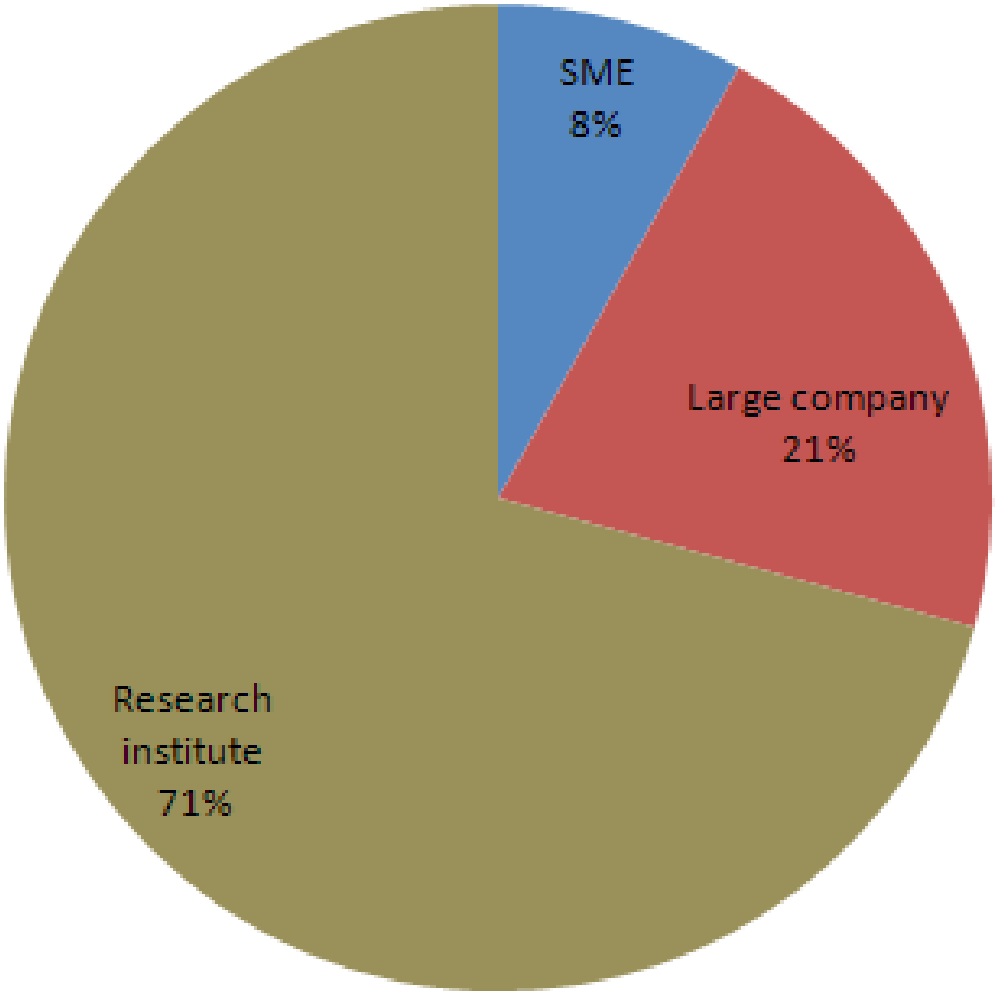
Organisational influence – Papyrus (Gamalielsson et al. 2011 @ OSS 2011) ...



Papyrus: proportion of commits per different affiliation types

Organisational influence
(Gamalielsson et al. 2011 @ OSS 2011) ...





Total affiliation type commit influence (left: Topcased, right: Papyrus)

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Modelling tools and community analysis ...

- The potential for sustainability of modelling tools needs to be evaluated prior to organisational adoption
- Some modelling tools are available as Open Source Software, with associated ecosystems
- Quantitative assessment of the health of such ecosystems is one important means in the evaluation of modelling tool sustainability
- Projects with healthy ecosystems are more likely to be maintained for a long time

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Open Issues to be explored in LIM-IT ...

What do you want to know about a community and beyond?

It is essential to have a focus ...

- How active is the community?
- To what extent are companies involved in the community?
- Is the community vulnerable?
- What shape does the community have?
- Is there good support within the community?
- etc.

… and systematically explore issues related to model lock-in and model interchange (interoperability) between tools.

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Some sources (1/2) ...

- Gamalielsson, J., Lundell, B. & Mattsson, A. (2011). Open Source Software for Model Driven Development: A Case Study, In Hissam, S. (Eds.) Open Source Systems: Grounding Research, IFIP Advances in Information and Communication Technology, Vol. 365, ISBN: 978-3-642-24417-9, Springer, Boston, pp. 348-367.
- Gray, J.P., Liu, A., Scott, L. (2000) Issues in software engineering tool construction, Information and Software Technology, Vol. 42(2), pp. 73-77.
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- Lundell, B. and van der Linden, F. (2012) Open Source Software as Open Innovation: Experiences from the Medical Domain, In Eriksson Lundström, J.S.Z., Wiberg, M., Hrastinski, S., Edenius, M. & Ågerfalk, P. J., (Eds.) Managing open innovation technologies, Springer, pp. 3-16.
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