Companies involvement in Open Source Software ecosystems : challenges and strategies to sustain ecosystems health

Research in progress

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Open source software (OSS)

- Their importance today for millions of users including businesses (Crowston et al., 2012; Nagle, 2018)
- The evolution of OSS development in the last 10 years, especially contributors from companies (von Krogh et al., 2012; Black Duck and North Bridge, 2016; Link and Jeske, 2017)
- The challenge of business interests facing the traditional values of OSS communities (Fitzgerald, 2006)

Companies' involvement in OSS communities

High degree

6 Companies becoming members of OSS communities (creating codes, supporting the community, co-managing the community)

5 Companies participating in OSS projects led by a community (creating codes, supporting the project)

4 Companies leading OSS projects (managing the project, creating codes, supporting the project)

3 Companies combining proprietary software with OSS

2 Companies as "community customers" using the OSS and sometimes also supporting the community with money

1 Companies imitating and translating ideas from OSS communities (duplicating incentives, knowledge-sharing within the firm, user-involvement)

Low degree

Sources : Ciesielska & Westenholz, 2016; Westenholz, 2012

Literature review: Business involvement in OSS

- **Motivation for the corporations** (Kendal et al., 2016)
- **Strategic, tactical or operational incentives :**
  - A way for developing resources (Mehra et al., 2011)
  - Creation and exploitation of value (Morgan et al., 2013)
  - Establishment of new business models (Ågerfalk & Fitzgerald, 2008; Dahlander & Magnusson, 2008)
- **Impacts on doing software development** (Capra et al., 2011; Germonprez et al., 2013)
- **Relationships between companies and open source communities**
  - Perception of roles and responsibilities (Ågerfalk and Fitzgerald, 2008)
  - Corporate engagement with open source communities (Germonprez et al., 2016)

Main trends: (1) mainly from the companies' point of view, (2) focus on specific projects, (3) focus on the initial phases of the relationship

The concept of software ecosystem

- **Software ecosystem** as the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services
(Manikas & Hansen, 2013)
  - An OSS ecosystem produces OSS solutions or services

- **Software ecosystems** are forming, becoming more and more complex and are today essential to the proper functioning of our digital society
(Jansen et al., 2013)

Research question

How the collaborative relationship between companies involved in an OSS ecosystem and the founding communities of projects forming this ecosystem can move from "harmonious" to "conflictual" to the point of having a negative impact on the health of the ecosystem ?

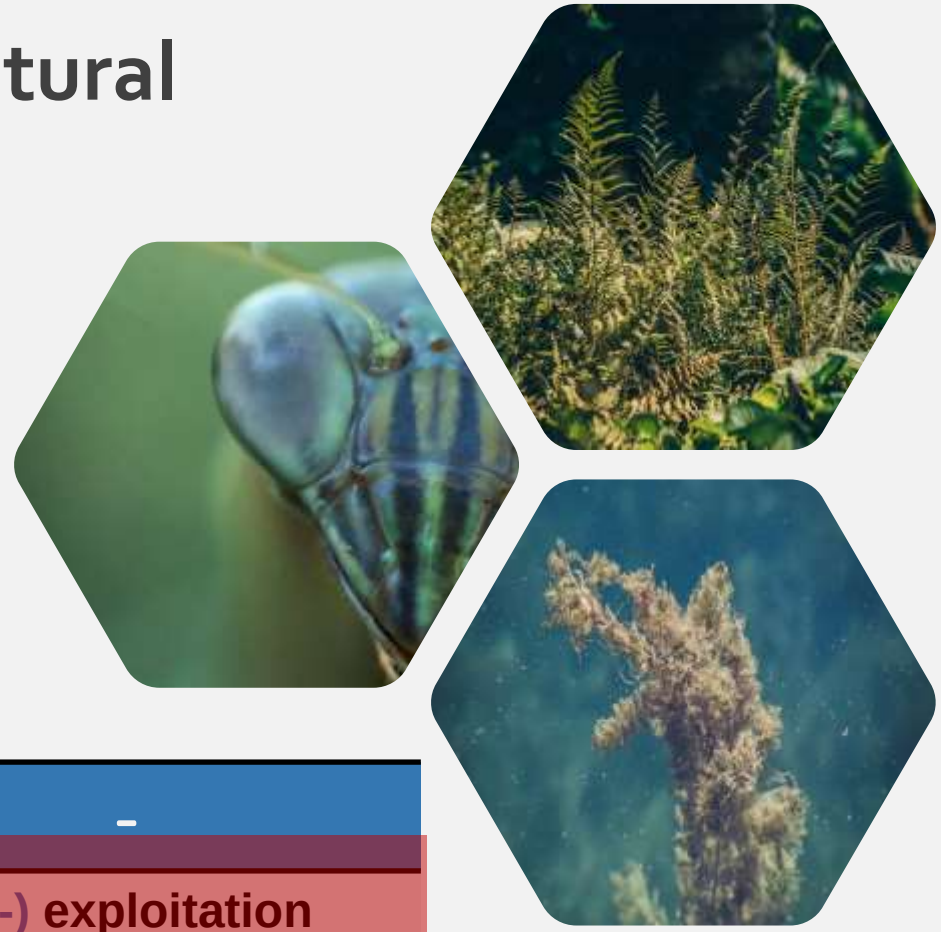
Conceptual basis

- Carillo & Marsan (2016) propose the **metaphor of the living organism** to study OSS communities and more particularly their health

- The **metaphor of the natural ecosystem** has been suggested in the software engineering and information systems literatures to advance the understanding of software ecosystems (Mens et al., 2014; Dhungana et al. 2013; Franco-Bedoya et al., 2017; Wang, 2018, 2019)

Interactions between organisms in a natural ecosystem

A parallel can be made with the possible types of **interaction between natural organisms in a context of collaborative production**



Effects	+	o	-
+	(+,+) mutualism	(+,o) commensalism	(+,-) exploitation (predator) parasitism
o	(o,+) commensal host	(o,o) neutralism	(o,-) amensalism
-	(-,+) exploitation (prey) parasitism	(-,o) amensal host	(-,-) competition

Interactions between organisms of different species in an ecosystem can evolve and change over time

Carillo, Marsan & Negoita (2017)

Methodology

- **Recruitment of participants** at the Open Source Summit Europe 2017 (Prague, Czech Republic) and the Open Source Leadership Summit 2019 (Half Moon Bay, SF, USA)
- **In-depth interviews** with 16 contributors (developer, maintainer or community manager), 4 more planned

> *Tell me about cases in which relationships between OSS communities and the corporations involved in an OSS ecosystem have gone from harmonious to conflictual*

- **Codification** of interview transcripts with Nvivo software
  - Use of reasoning by analogy and metaphors (Berger-Douce & Durieux-Nguyen, 2002) of the organization as an organism and of the software ecosystem as a natural ecosystem

Results (preliminary)

Situation 1 : mutualism (+,+) → amensalism (o,-)

The company is very involved in the development of the code, but **stops contributing to or maintaining the code** at some point, not having any more interest in it.

From **mutualism** to **amensalism** where organism A (the company) creates a situation of weakness for organism B (the community of volunteers) that no longer receive contributions from the other one.

Results (preliminary)

Situation 2 : mutualism (+,+) → parasitism (+,-)

The company is involved in the development of the code and, for its growth needs, **hires voluntary contributors from the community, one by one.**

From **mutualism** to **parasitism** where, at the end, organism A (the company) comes to exploit completely organism B (the community of volunteers) until its final extinction.

Results (preliminary)

Situation 3 : mutualism (+,+) → competition (-,-)

The company, led by its economic needs, **wants to take control of the open source project** and bring it in a direction where the community does not agree.

From **mutualism** to **competition** in which organism B (the volunteer community) resists the influence from organism A (the company) and where both species end up competing for available resources.

Expected contribution

- **An answer to the calls** of Wang (2018, 2019) to use metaphors and theories from natural ecosystems in Information Systems research
- **A framework** to identify the different types of relationships between OSS communities and companies involved in OSS ecosystems
- **A better understanding** of how initially positive relationships are deteriorating between OSS communities and companies involved in OSS ecosystems

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Thank you for your attention

References

- **Ågerfalk, P. J., & Fitzgerald, B. (2008).** Outsourcing to an unknown workforce: Exploring opensurcing as a global sourcing strategy. MIS quarterly, 385-409.
- **Berger-Douce, S., & Durieux, F. (2002).** Le raisonnement par analogie et par métaphore en sciences de gestion.
- **Black Duck and North Bridge. (2016).** 10th annual Future of Open Source Survey to examine trends in open source, hosted by Black Duck and North Bridge (https://opensource.com/business/16/5/2016-future-open-source-survey)
- **Boucher, D. H., James, S., & Keeler, K. H. (1982).** The ecology of mutualism. Annual Review of Ecology and Systematics, 13(1), 315-347.
- **Capra, E., Francalanci, C., Merlo, F., & Rossi-Lamastra, C. (2011).** Firms' involvement in Open Source projects: A trade-off between software structural quality and popularity. Journal of Systems and Software, 84(1), 144-161.
- **Carillo, K., & Marsan, J. (2016).** The dose makes the poison: Exploring the toxicity phenomenon in online communities. Int'l Conf. Information Systems (ICIS).
- **Carillo, K., Marsan, J., & Negoita, B. (2017).** Exploring the biosphere–towards a conceptualization of peer production communities as living organisms. SIGOPEN Pre-ICIS 2017 Workshop on Open Phenomena.
- **Ciesielska, M., & Westenholz, A. (2016).** Dilemmas within commercial involvement in open source software. Journal of Organizational Change Management, 29(3), 344-360.
- **Crowston, K., Wei, K., Howison, J., & Wiggins, A. (2012).** Free/Libre open-source software development: What we know and what we do not know. ACM Computing Surveys (CSUR), 44(2), 7.

References

- **Dahlander, L., & Magnusson, M. (2008).** How do firms make use of open source communities?. Long range planning, 41(6), 629-649.
- **Dhungana, D., Groher, I., Schludermann, E., & Biffl, S. (2013).** Guiding principles of natural ecosystems and their applicability to software ecosystems. In Jansen, S., Cusumano, M., Brinkkemper, S. (eds). Software Ecosystems: Analyzing and Managing Business Networks in the Software Industry. Edward Elgar Publishers.
- **Draxler, S., & Stevens, G. (2011).** Supporting the collaborative appropriation of an open software ecosystem. Computer supported cooperative work (CSCW), 20(4-5), 403-448.
- **Fitzgerald, B. (2006).** The transformation of open source software. MIS Quarterly, 587-598.
- **Franco-Bedoya, O., Ameller, D., Costal, D., & Franch, X. (2017).** Open source software ecosystems: A Systematic mapping. Information and software technology, 91, 160-185.
- **Germonprez, M., Allen, J. P., Warner, B., Hill, J., & McClements, G. (2013).** Open source communities of competitors. Interactions, 20(6), 54-59.
- **Germonprez, M., Kendall, J. E., Kendall, K. E., Mathiassen, L., Young, B., & Warner, B. (2016).** A theory of responsive design: A field study of corporate engagement with open source communities. Information Systems Research, 28(1), 64-83.
- **Jansen, S., Cusumano, M. A., & Brinkkemper, S. (Eds.). (2013).** Software ecosystems: analyzing and managing business networks in the software industry. Edward Elgar Publishing.
- **Kendall, J. E., Kendall, K. E., & Germonprez, M. (2016).** Game theory and open source contribution: Rationale behind corporate participation in open source software development. Journal of Organizational Computing and Electronic Commerce, 26(4), 323-343.

References

- **Link, G. J., & Jeske, D. (2017).** Understanding Organization and Open Source Community Relations through the Attraction-Selection-Attrition Model. International Symposium on Open Collaboration (p. 17). ACM.
- **Manikas, K. (2016).** Revisiting software ecosystems research: A longitudinal literature study. Journal of Systems and Software, 117, 84-103.
- **Manikas, K., & Hansen, K. M. (2013).** Software ecosystems–A systematic literature review. Journal of Systems and Software, 86(5), 1294-1306.
- **Mens, T., Claes, M., Grosjean, P., & Serebrenik, A. (2014).** Studying evolving software ecosystems based on ecological models. In Evolving Software Systems (pp. 297-326). Springer, Berlin, Heidelberg.
- **Morgan, L., Feller, J., & Finnegan, P. (2013).** Exploring value networks: theorising the creation and capture of value with open source software. European journal of information systems, 22(5), 569-588.
- **Nagle, F. (2018).** Open source software and firm productivity. Management Science, 65(3), 955-1453.
- **Von Krogh, G., Haefliger, S., Spaeth, S., & Wallin, M. W. (2012).** Carrots and rainbows: Motivation and social practice in open source software development. MIS quarterly, 649-676.
- **Wang, P. (2018).** Taking the" Eco" Seriously: A Multilevel Model of Digital Innovation Ecosystems. PACIS. 186. https://aisel.aisnet.org/pacis2018/186
- **Wang, P. (2019).** Theorizing Digital Innovation Ecosystems: A Multilevel Ecological Framework. European Conference on Information Systems (ECIS), Stockholm & Uppsala, Sweden, June 8-14, https://aisel.aisnet.org/ecis2019_rp/9
- **Westenholz, A. (Ed.) (2012).** The Janus Face of Commercial Software Communities – An Investigation into Institutional (Non)Work by Interacting Institutional Actors, Copenhagen Business School Press, Frederiksberg.

Methodology

Selection of participants (criteria) :

- **Is a contributor** (e.g., Community Manager, Programmer, Tester, Documentation Producer) currently active in interdependent software projects;
- **Has been a contributor** (e.g., Community Manager, Programmer, Tester, Documentation Producer) in the past five years in interdependent software projects;
- **Currently having a management position in an open source foundation** (e.g., Linux Foundation or Apache Software Foundation) and has had contacts with software ecosystems in the past five years;
- **Have held a management position in an open source foundation** (e.g., Linux Foundation or Apache Software Foundation) in the past five years and has had contacts with software ecosystems in the past five years;
- **Being involved in the development of at least one software application aimed at improving the quality of development of software projects or ecosystems** (e.g., Bitergia's GrimoireLab, SonarQube by SonarSource, DependencyCI);
- **Has been a guest speaker at major events on software ecosystems** such as the OSS Summit in the past five years and has had contacts with software ecosystems in the past five years.