

Never Alone: How Collaboration has Changed and is Changing in Software Development

Daniela Damian
University of Victoria

2018-2019 Distinguished Speaker Series
Institute for Software Research,
University of California - Irvine
April 12, 2019



Features & tools — Why Xero — Pricing — Find an installer

App marketplace

Explore 700+ time-saving apps that connect with Xero

🔍 Search app marketplace for apps, business types, functions

Featured apps

<p>simPRO</p> <p>Inventory, Invoicing & Jobs</p> <p>simPRO</p> <p>★★★★ (40)</p> <p>Your comprehensive software tool for Electrical, Plumbing, Security, Heat Pump, HVAC.</p>	<p>WorkflowMax</p> <p>Time Tracking, Invoicing & Jobs</p> <p>WorkflowMax</p> <p>★★★★ (30)</p> <p>A Xero product offering all-in-one workflow. Over 10,000 service businesses trust</p>	<p>vend</p> <p>Inventory, Point of Sale</p> <p>Vend</p> <p>★★★★ (19)</p> <p>Run the world's best retail with point of sale & inventory software retailers love.</p>	<p>UNLEASHED</p> <p>Inventory</p> <p>Unleashed Software</p> <p>★★★★ (224)</p> <p>Unleashed provides online inventory software for Xero, allowing accurate costs.</p>	<p>TRADIFY</p> <p>Time Tracking, Invoicing & Jobs</p> <p>Tradify</p> <p>★★★★ (14)</p> <p>The complete job solution for trade contractors. Easy</p>
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<https://www.mytechlogy.com/IT-blogs/3312/do-we-benefit-from-the-eternal-microsoft-vs-apple-war/#.XKUsX-tKhSM>





collaborate to innovate

by leveraging talent at remote sites

proximity to customers

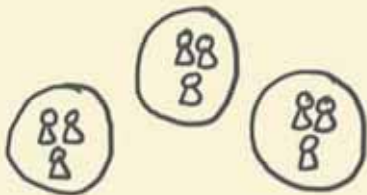


distributed issue resolution 2.5 times longer than co-located

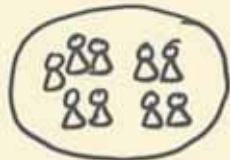
PARAPHRASED
CONWAY'S LAW

THE STRUCTURE OF SOFTWARE WILL MIRROR THE STRUCTURE OF THE ORGANISATION THAT BUILT IT *for example*

ORGANISATION



SMALL DISTRIBUTED
TEAMS

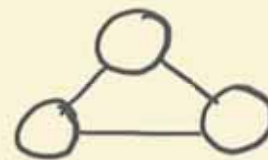


LARGE COLOCATED
TEAMS

*are more likely
to produce*



SOFTWARE



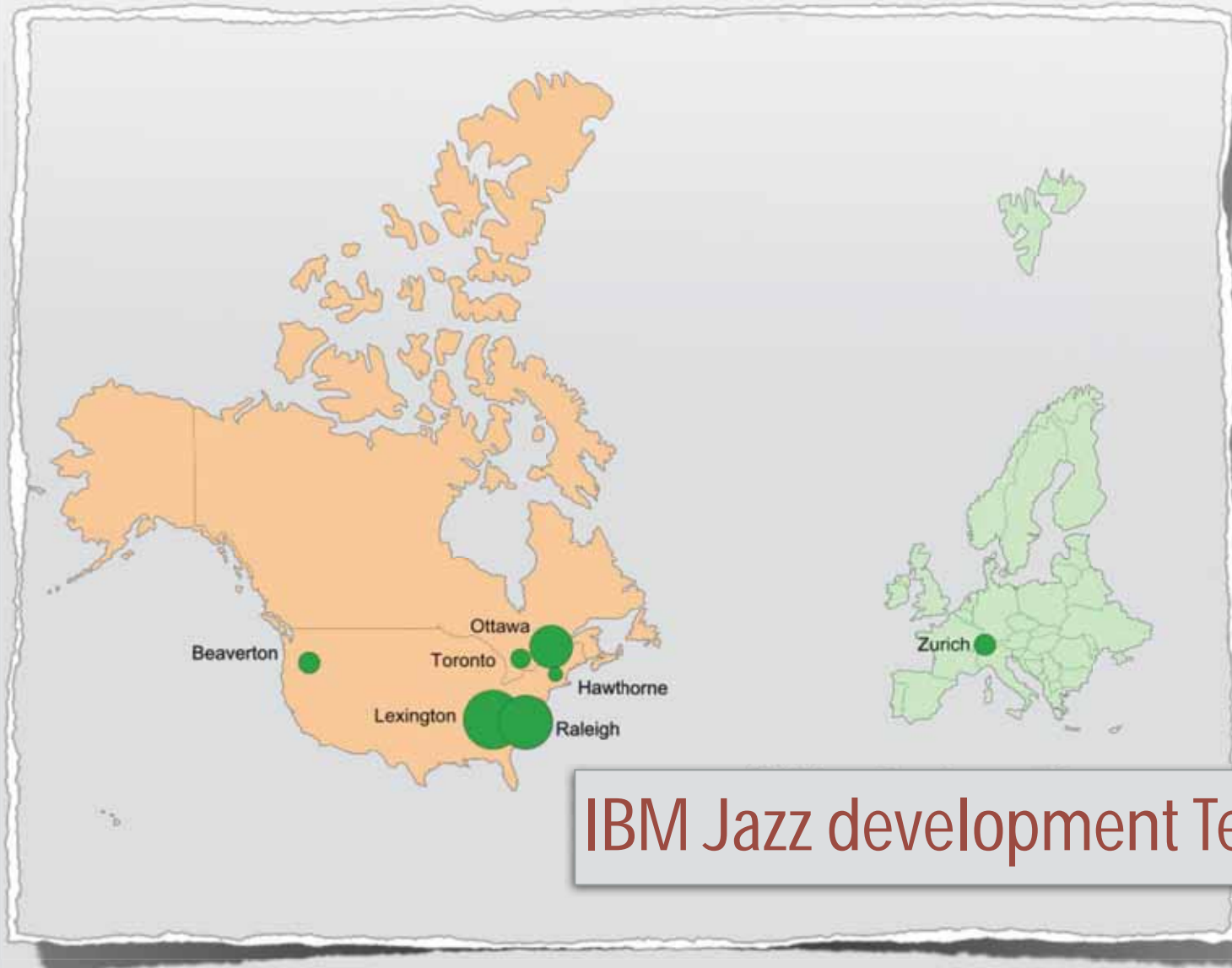
MODULAR, SERVICE
ARCHITECTURE



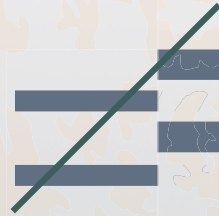
MONOLITHIC
ARCHITECTURE

sketchplanations

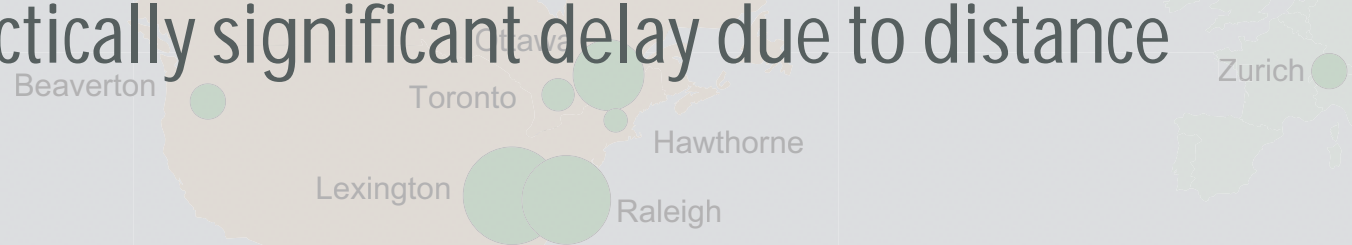
OUR INVESTIGATION



IBM Jazz development Team, 2007

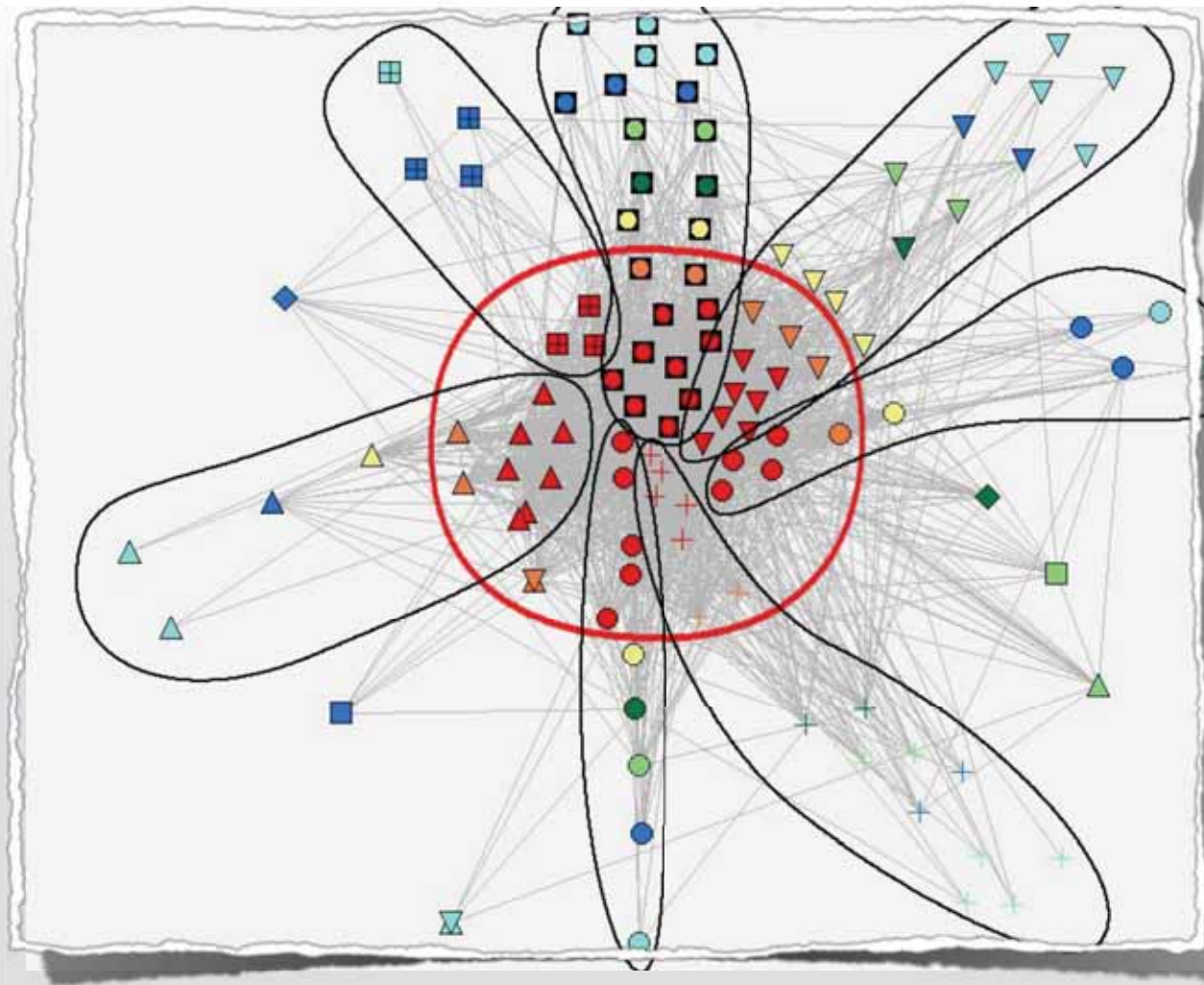


no practically significant delay due to distance



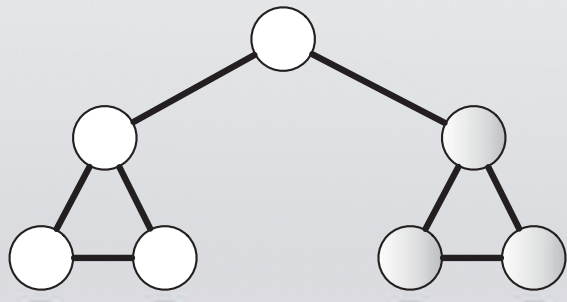
IBM Jazz Development Team

Legend:
Team Size 10 ● 20 ●

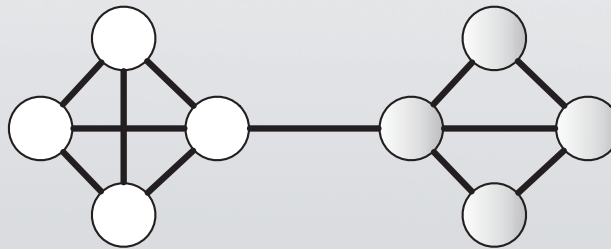


Effective communication through a core set of contributors

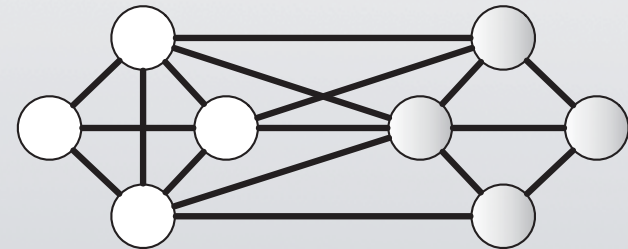
FOCUS ON PERFORMANCE



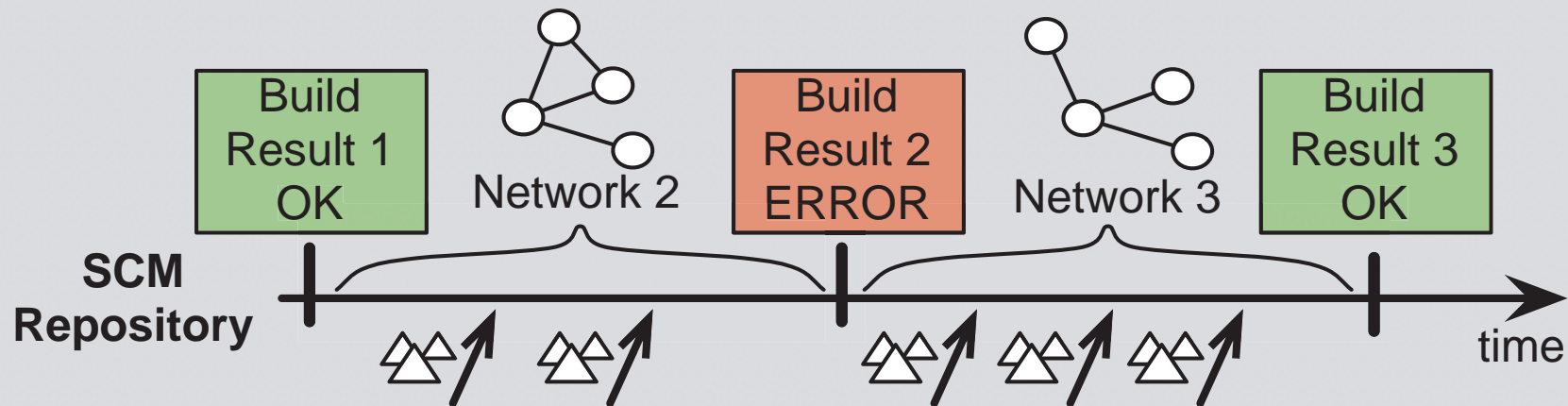
Hierarchical



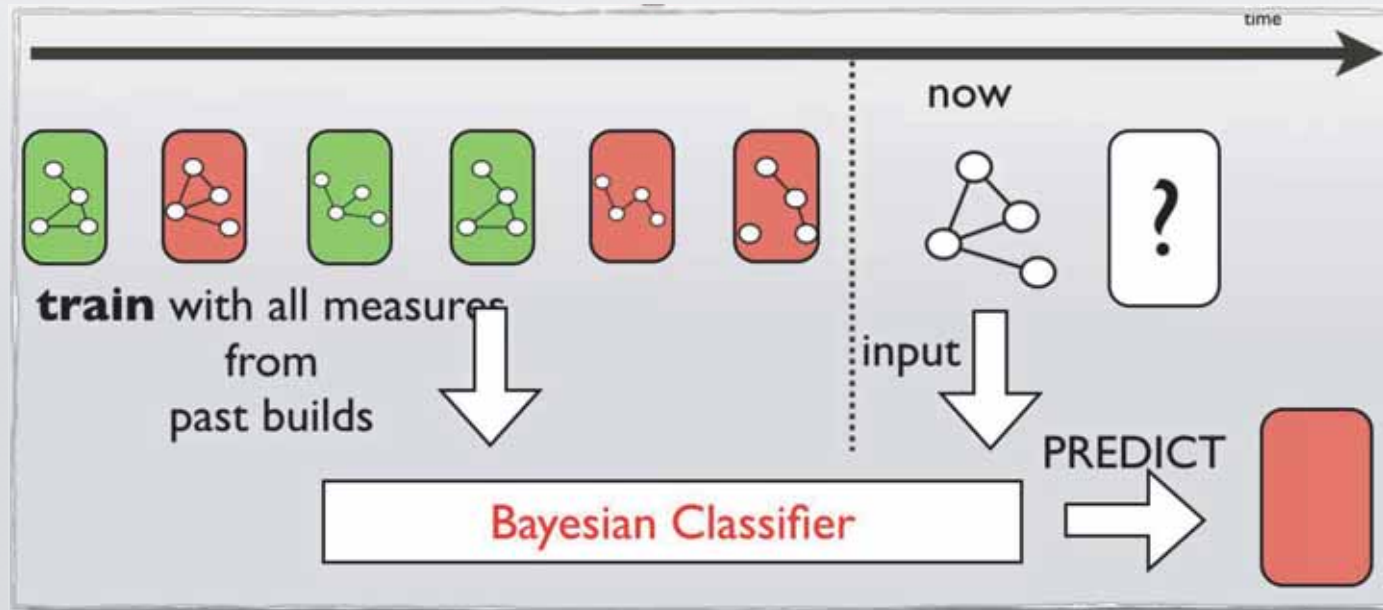
Brokers



Complete



FOCUS ON PERFORMANCE



Communication model predicted about 70% of failed builds

from Co-located to Distributed

communication matters!

from Co-located to Distributed

collaboration quality greatly affects software success



Closed source, corporate-led contributions,
intra- and inter-organizational partnerships



trust

awareness

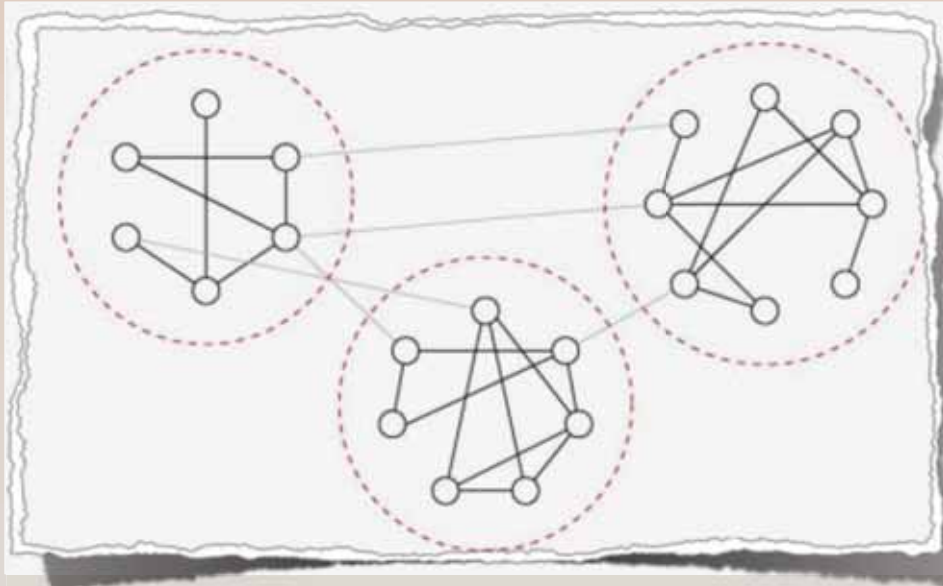
cultural affinity

aligned autonomy



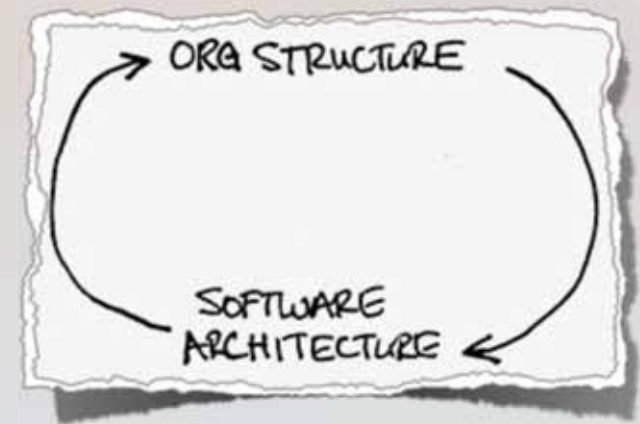
Innovate through decentralized, large contributor base

EARLY STUDIES OF OSS



socio-technical congruence

the more active contributors are also
the more active communicators



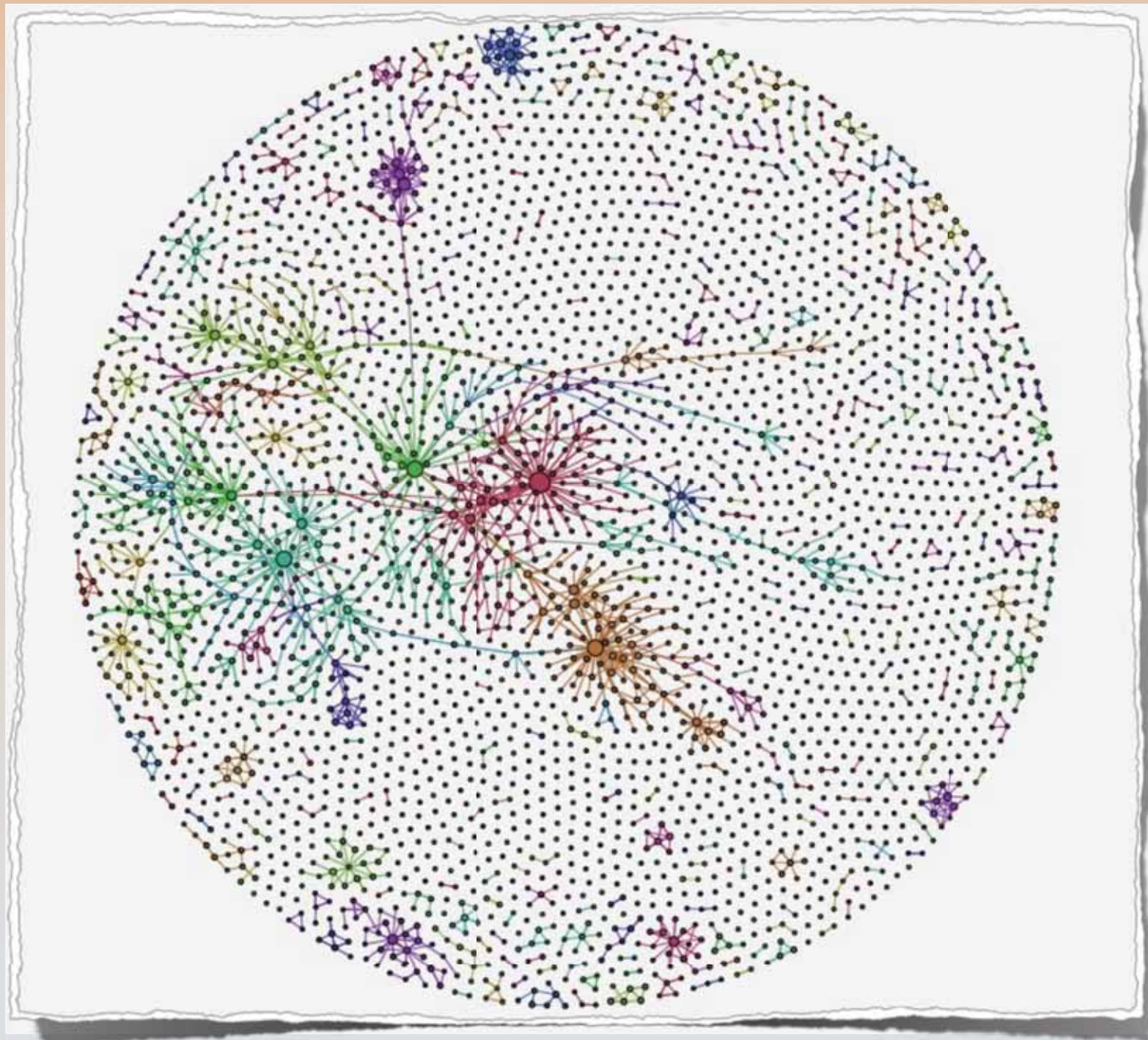
from Closed to Open

communication medium might not matter!

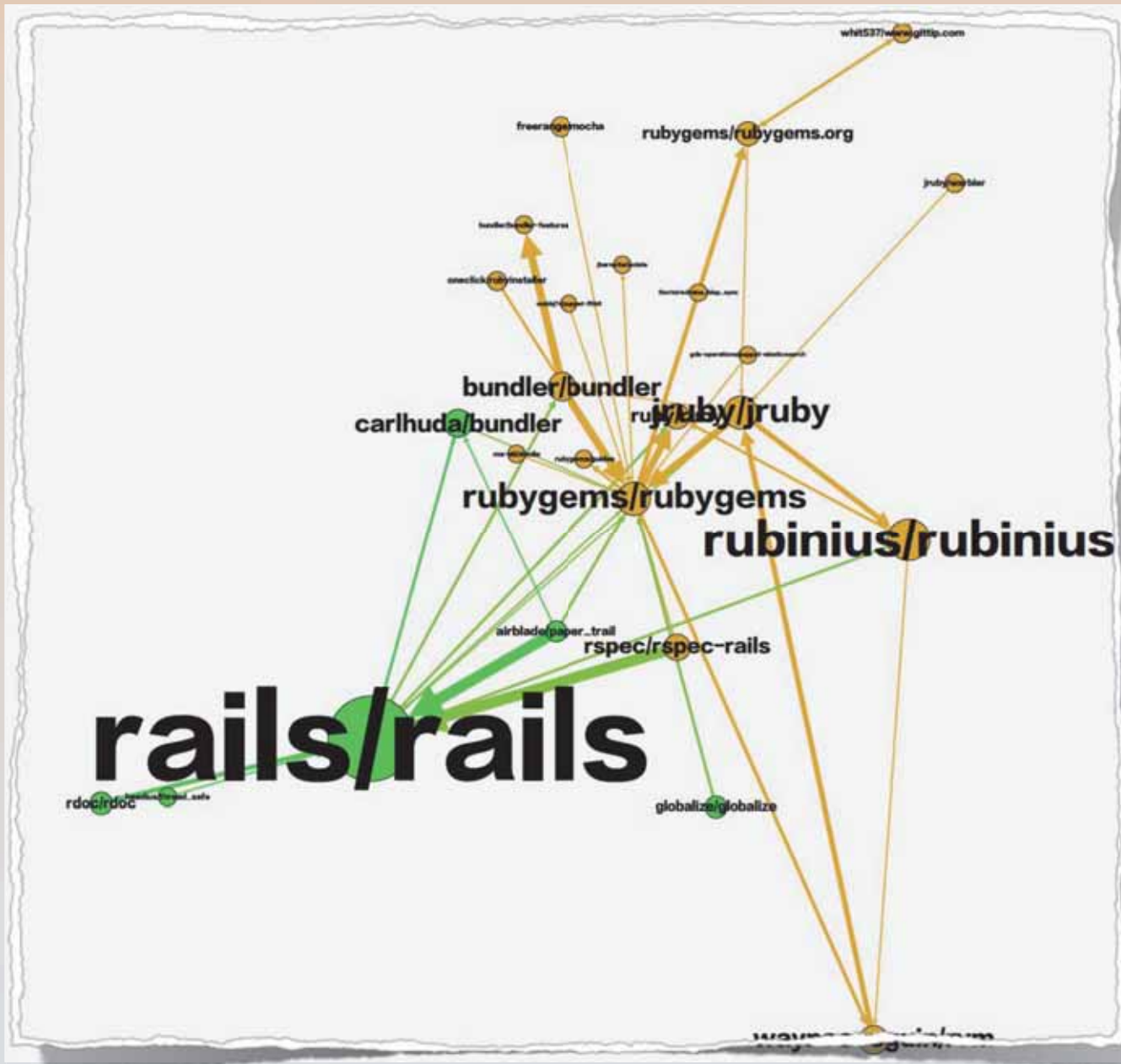
from Closed to Open

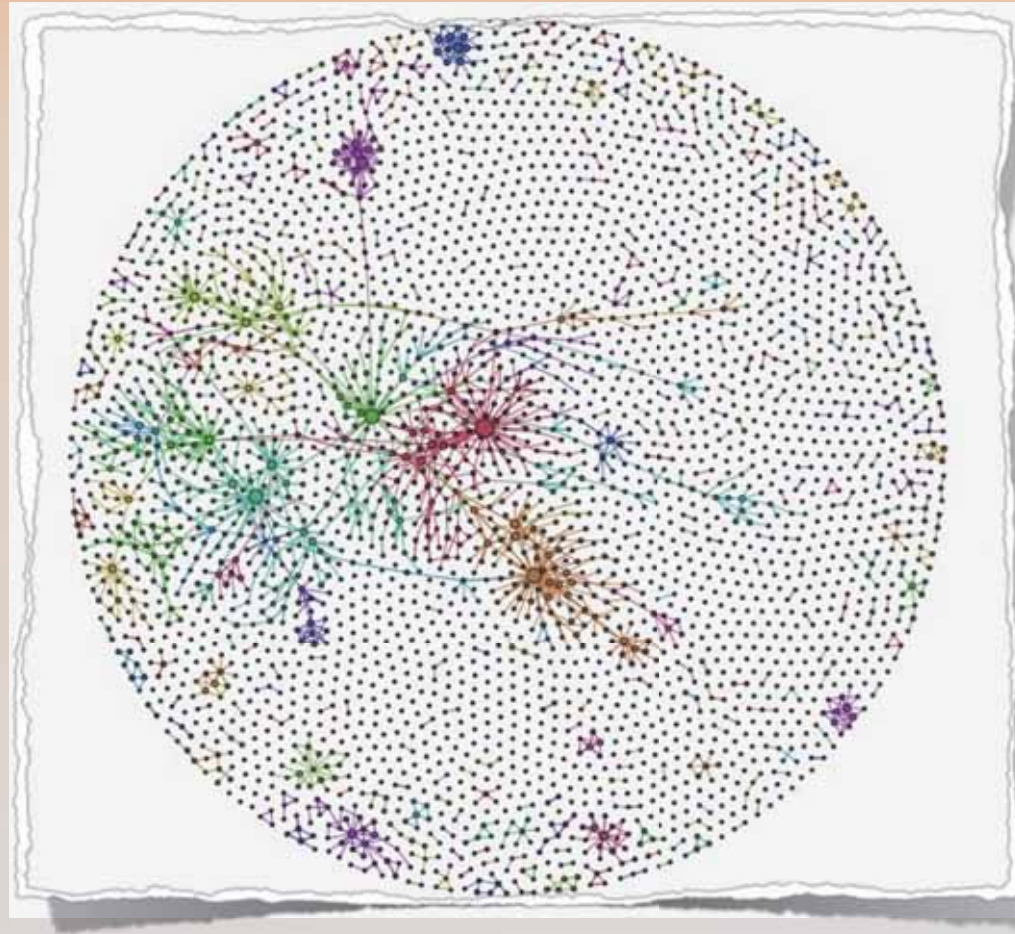
governance based on quality of work

THE GITHUB REVOLUTION

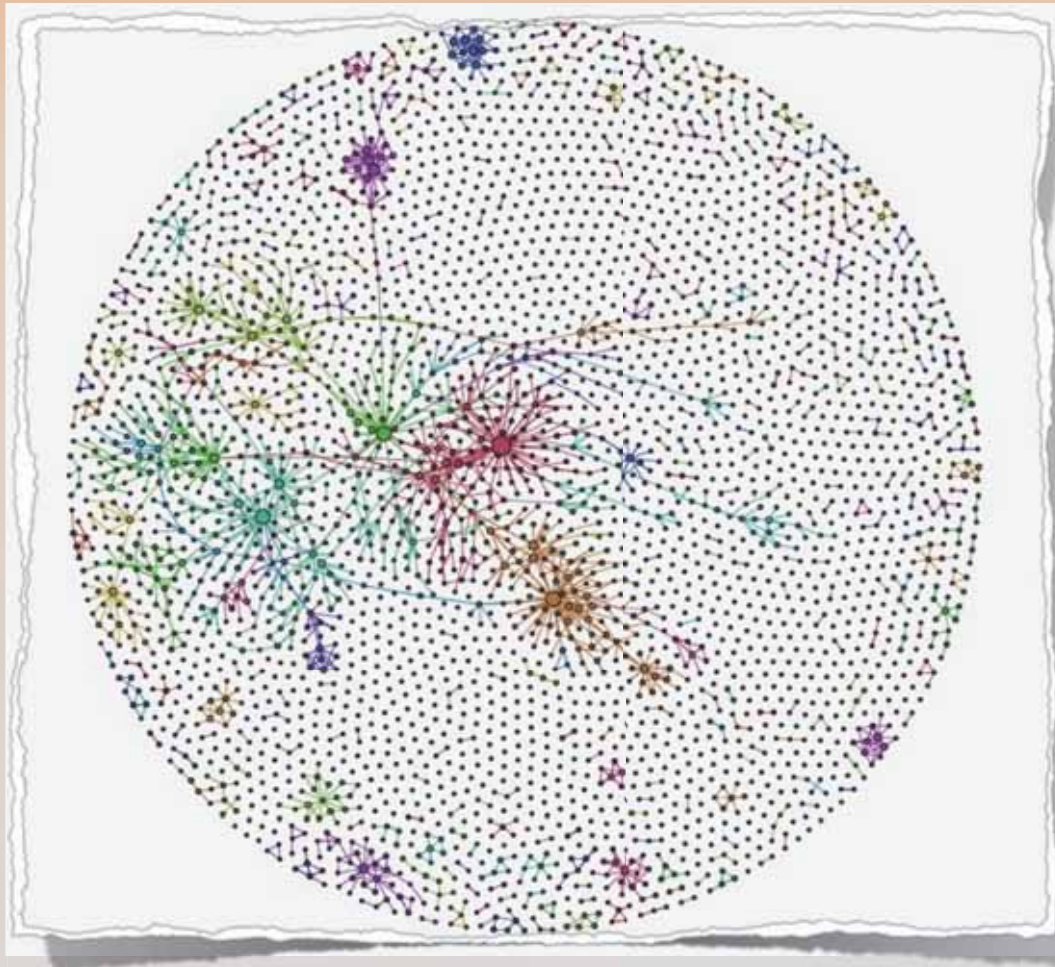


Blincoe, K, F. Harrison, N. Kaur, D. Damian: Reference Coupling: An Exploration of Inter-project Technical Dependencies and their Characteristics within Large Software Ecosystems, *Information and Software Technology*, 2019

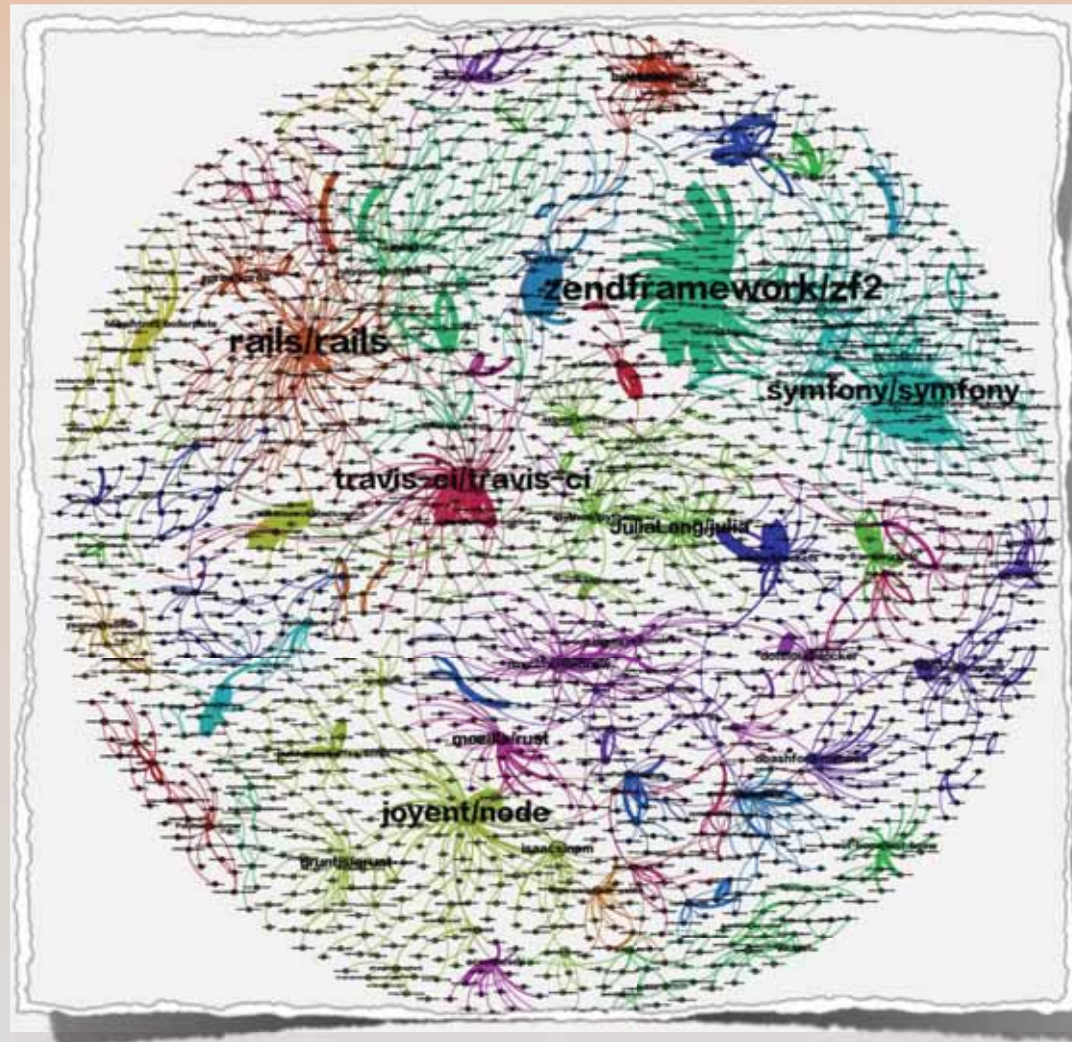




communities are highly interconnected

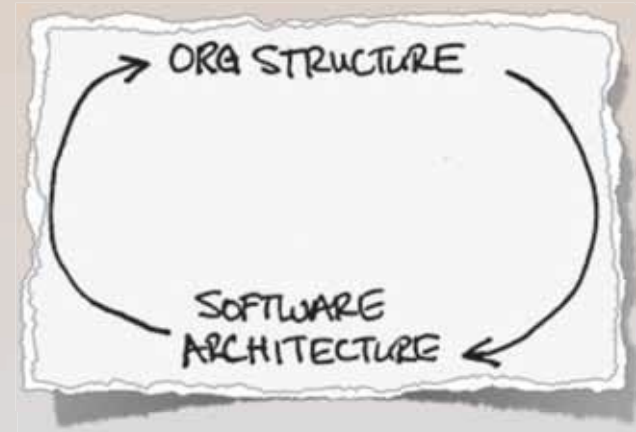
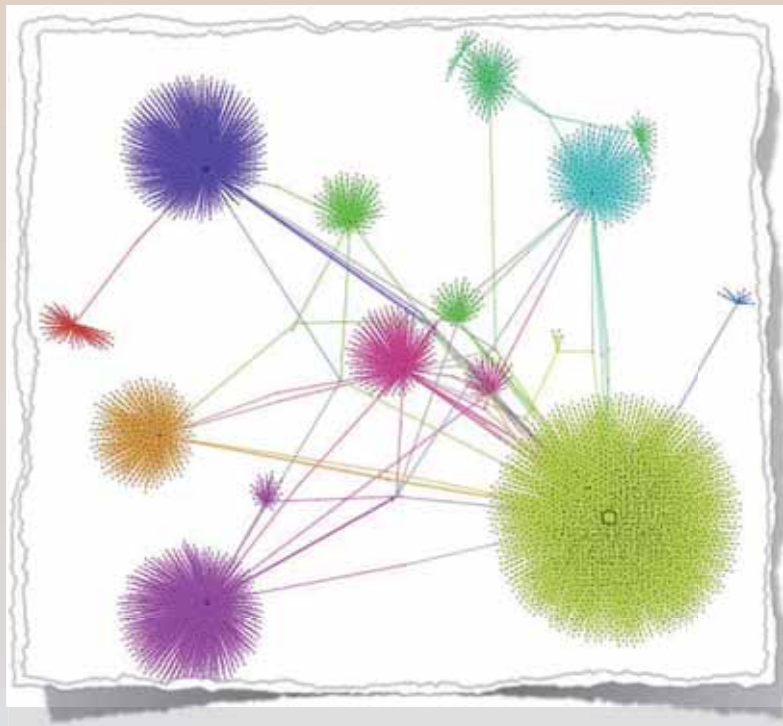


the largest connected component: 57% (about 10K projects)



largest connected (giant) component in Github

SOCIAL BEHAVIOUR ALIGNED WITH TECHNICAL DEPENDENCIES?



Project Owners followed by other
Owners in their ecosystem

FIRM-SPONSORED OSS

“As a software company, it’s impossible to keep up if you have to write every line of code yourself, instead of using solutions that multiple organizations and countless individuals are developing collectively on a massive scale”

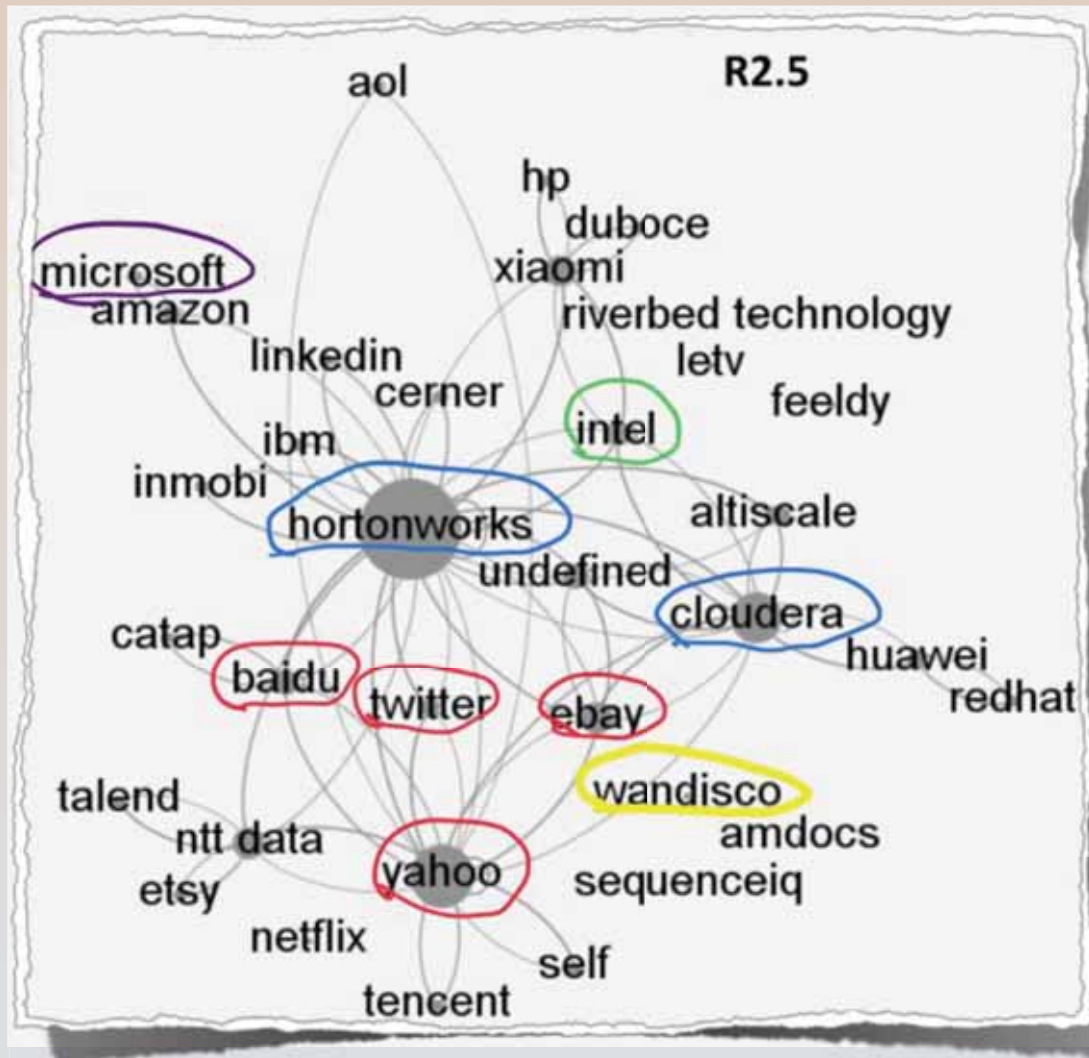
Mike Evans, vice president of technical business development at Red Hat.

THE COOPETITION ERA

“[Open] Software is becoming the leading technique by which companies both compete and collaborate with one another”

Mike Milinkovich, executive director of the Eclipse Foundation and a board member of the Open Source Initiative

APACHE HADOOP



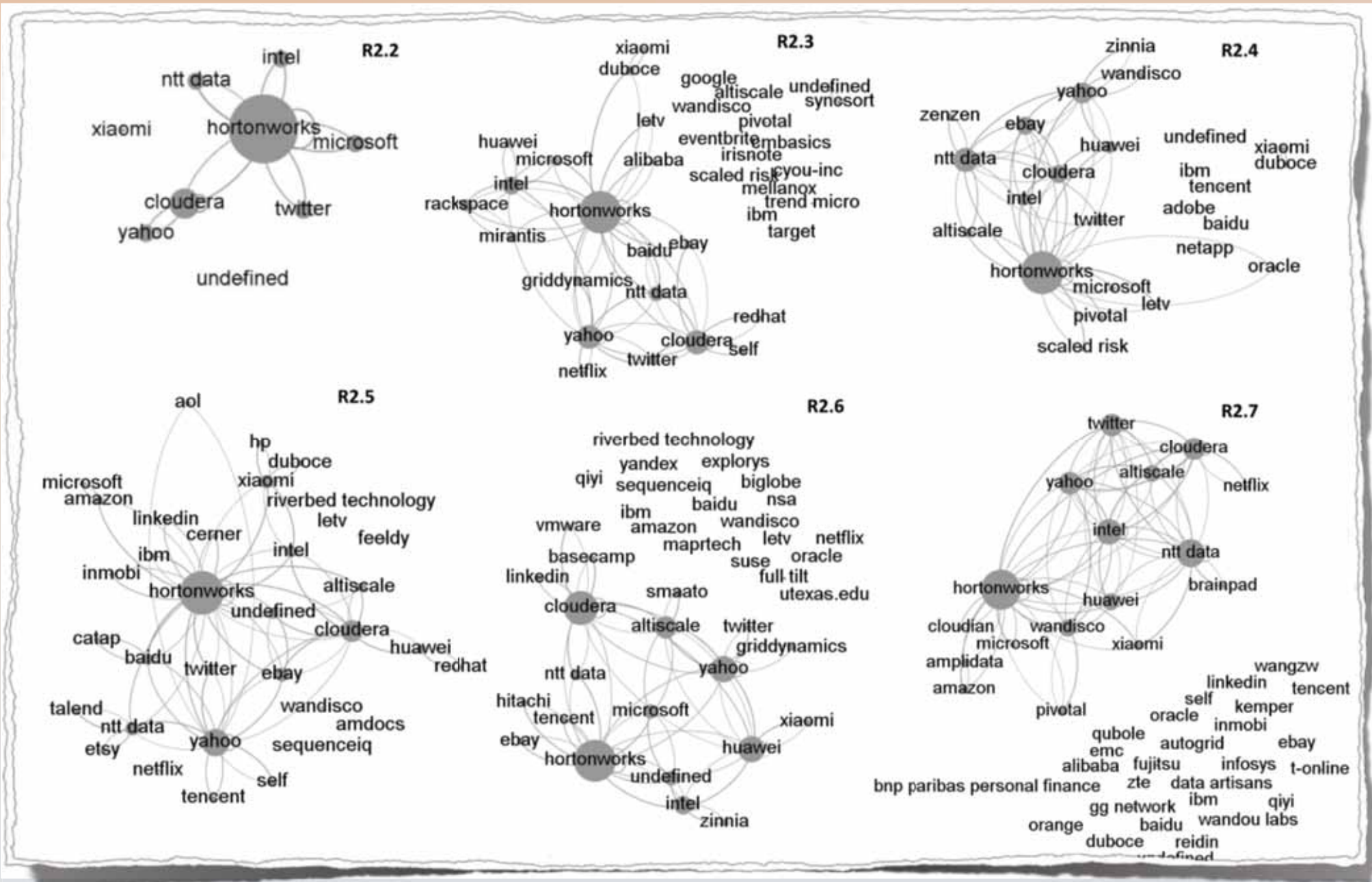
Platform providers

Platform users

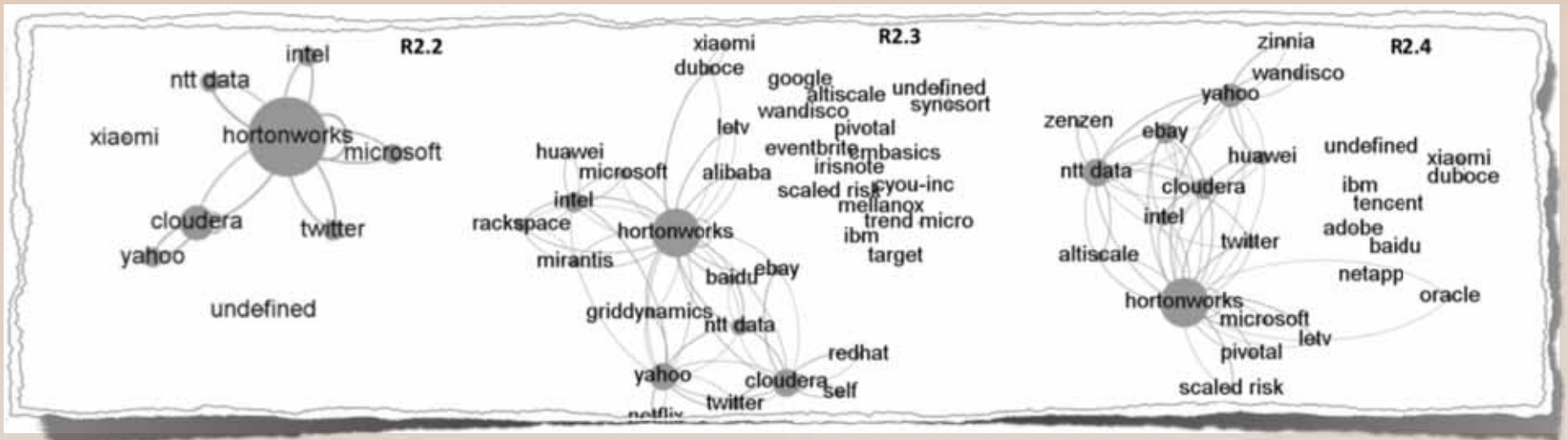
Infrastructure providers

Service providers

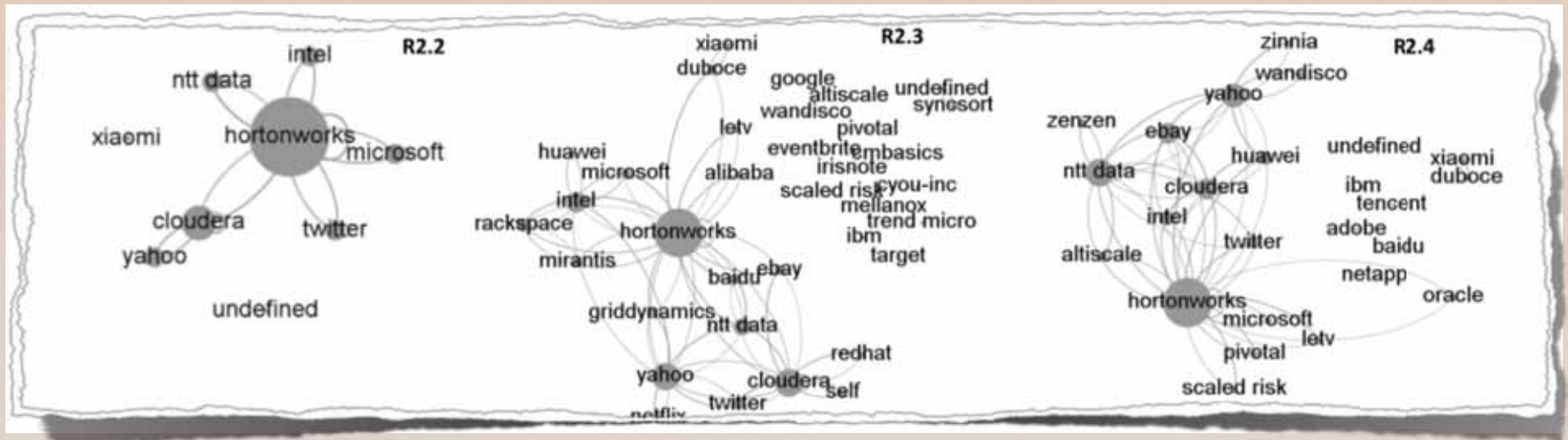
Platform supporters



Linaker, J., et al., : How Firms Adapt and Interact in Open Source Ecosystems, *REFSQ*, 2016



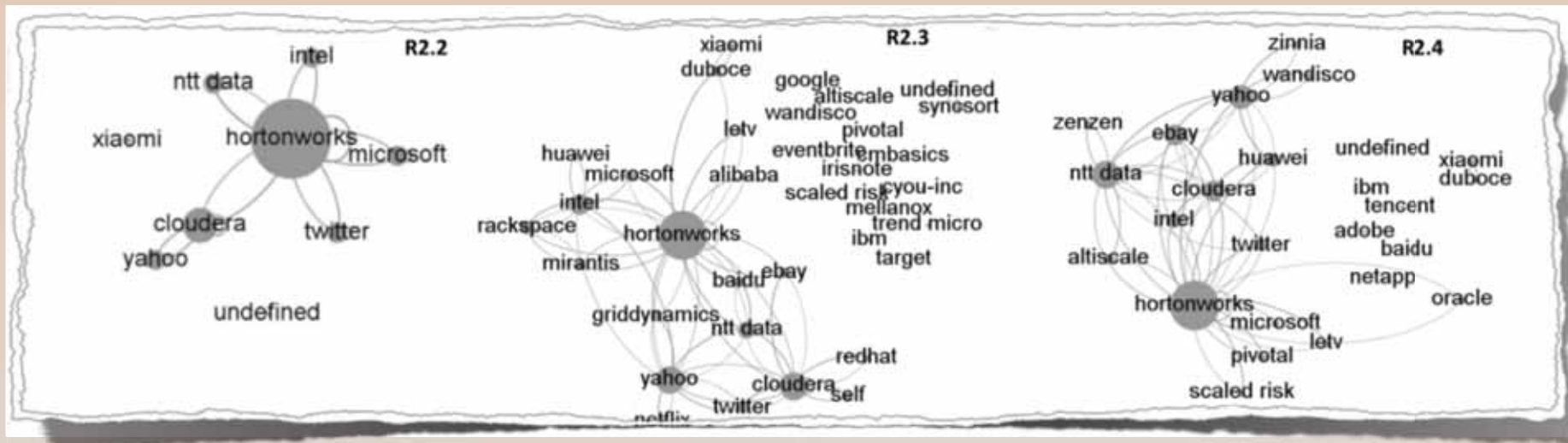
Social Network Measures and Influence in the Ecosystem



Influence through:

issues reported and included in release

issues interacted with and included in release

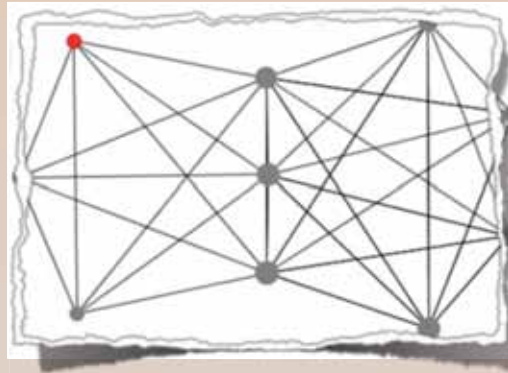


collaboration patterns

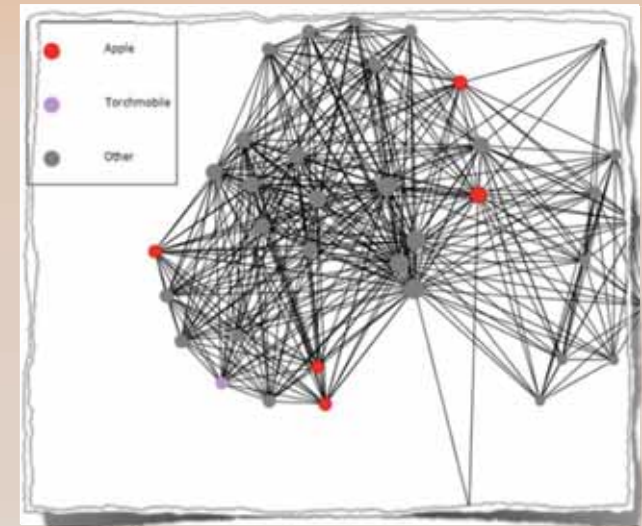
linked to

influence in the ecosystem

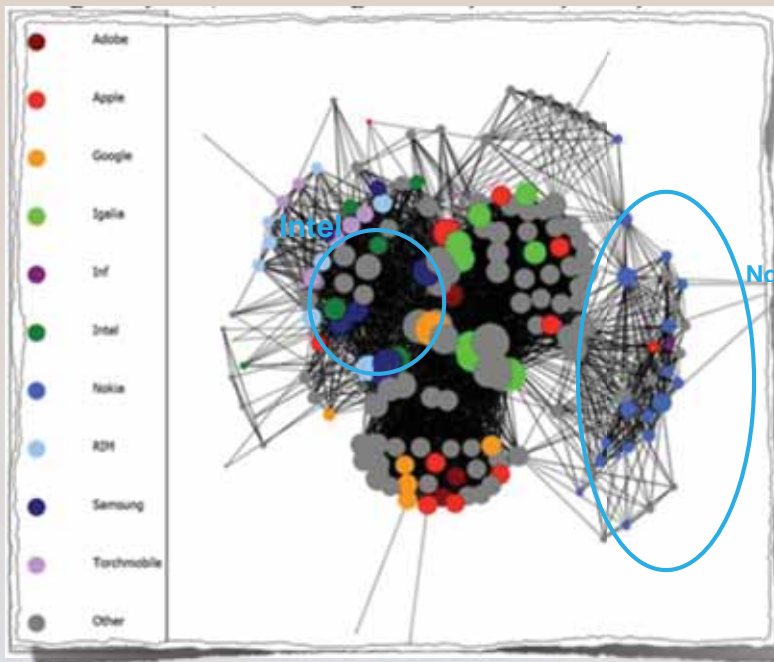
THE WEBKIT ECOSYSTEM



2006: Apple releases WebKit

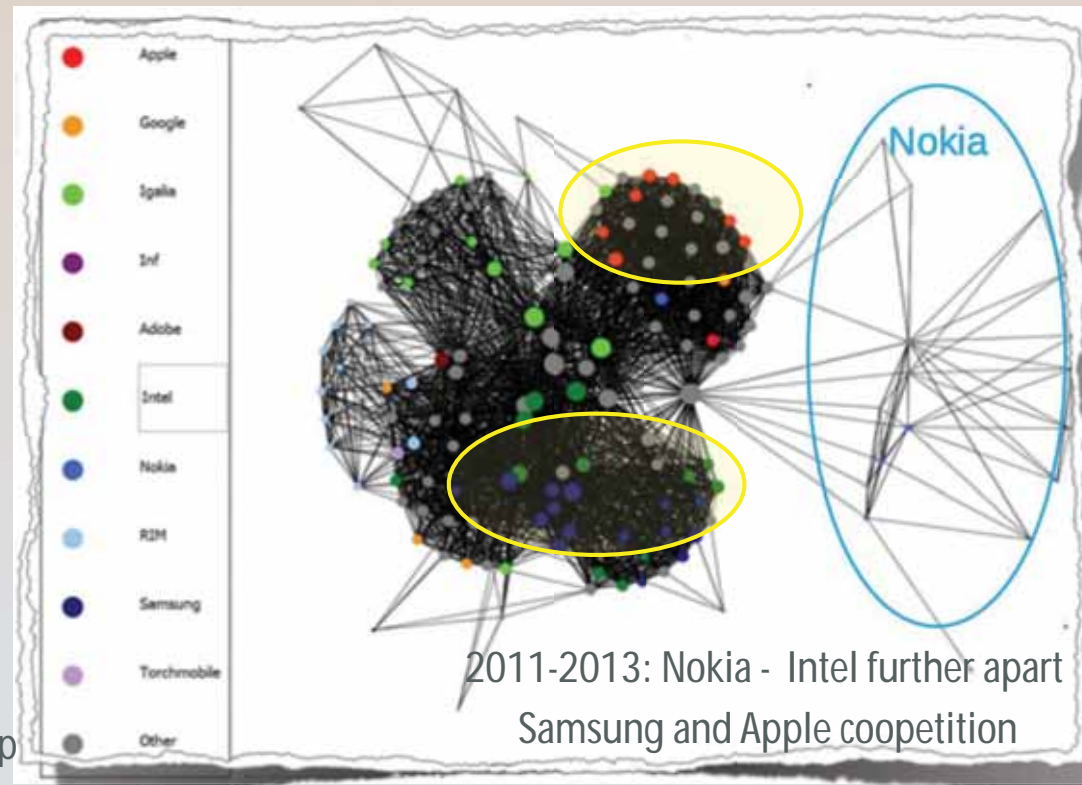


2007-2008: Apple releases the iPhone



2008-2011

Nokia and Intel break out due to Nokia-Microsoft partnership



2011-2013: Nokia - Intel further apart
Samsung and Apple competition

from Cooperation to Coopetition

the Customer is King

from Cooperation to Coopetition

Increased collaboration → competitive advantage



Open source platform and ecosystem,
community contributions,
software grows organically

PROPRIETARY PLATFORMS

IBM CLM ECOSYSTEM

IBM Collaborative Lifecycle Management

The IBM Rational Collaborative Lifecycle Management Solution is a set of seamlessly integrated application lifecycle management (ALM) tools that work together as one. Use Collaborative Lifecycle Management (CLM) to manage requirements, plan projects, track changes, and manage quality, all on a single platform.



Explore now

Try

Connect with IBM

Capabilities

Collaborative Lifecycle Management provides the following capabilities:



Define and manage requirements with
IBM Rational DOORS®
Next Generation



Plan, track work, and manage source
with
IBM® Rational Team
Concert™



Develop and execute your test plan with
IBM Rational® Quality
Manager

jazz.net: open issue tracker

The screenshot shows the jazz.net forum homepage. At the top, there is a navigation bar with links for PRODUCTS, DOWNLOADS, FORUM, BLOGS, LIBRARY, DEPLOYMENT, and SUPPORT. On the right side of the navigation bar, there are buttons for SIGN UP and LOG IN, along with a search icon and the number 1,577. Below the navigation bar, a banner reads "It's all about the answers!". Underneath the banner, there are tabs for Questions, Tags, Users, and Badges. A button labeled "Ask a question" is also present. Below the tabs, there are sorting options: Active, Newest, Most liked, No answers, No accepted answer, and Most Viewed. A search bar is located on the right side, with the text "Search the forum" and a search icon. Below the search bar, there are links for questions, tags, and users. The main content area displays a list of questions. Each question entry includes the question title, the user who asked it, the time it was asked, and statistics for answers, likes, and views. There are also tags associated with each question. On the right side of the main content area, there are statistics for the forum: 63,014 questions and 109,871 answers. Below these statistics, there is a section for "Related tags" with a list of tags and their respective counts.

PRODUCTS DOWNLOADS FORUM BLOGS LIBRARY DEPLOYMENT SUPPORT SIGN UP LOG IN 1,577

It's all about the answers!

Questions Tags Users Badges Ask a question

Active | Newest | Most liked | No answers | No accepted answer | Most Viewed

Questions

Search the forum

questions tags users

63,014 questions
109,871 answers

Related tags

- rational-team-concert < 40,313
- usage < 10,212
- rational-quality-manager < 9,812
- extending < 9,783
- clm < 5,855
- configuration < 5,303
- troubleshooting < 5,295
- administration < 4,207
- rational-doors-next < 4,031

RQM Log shows Warning message about " PUT request for the ExecutionResult artifact without an Id and Adapter Library update
Ricardo Souza (17) | 57 mins ago
2 answers 0 likes 36 views
rational-quality-manager warning adapter-library troubleshooting

auto Locking files doesn't work properly, in the stream
Arun K Sriramiah (3.1k) | 1 hour ago
1 answer 0 likes 14 views
rational-team-concert scm control configuration source

Why DNG artifact Download for viewing spreadsheet file does not open spreadsheet with data?
Michael Laurendi (105) | 1 hour ago
0 answers 0 likes 7 views
spreadsheet upload usage file download rational-doors-next

How to compute a RQM artifact (test plan,test case..)UUID from its name or any other way?
Ajith O M (21) | 2 hours ago
1 answer 0 likes 52 views
rational-quality-manager extending api artifacts

Querying for sorted list of "unresolved" work item
Samit Mehta (31) | 5 hours ago
4 answers 0 likes 6.1k views

Atlassian's open issue tracker

The screenshot shows the Atlassian Jira System Dashboard. The top navigation bar includes the Jira logo, menu items for Dashboards, Projects, and Issues, a search bar, and a Log In button. The main content area is titled 'System Dashboard' and features an 'Introduction' section with three primary cards: 'Welcome!', 'Report a Bug', and 'Suggest a Feature'. The 'Welcome!' card provides an overview of the public issue tracker and links to community and support resources. The 'Report a Bug' card explains the process of reporting issues and links to bug fix policies. The 'Suggest a Feature' card details how to submit suggestions and links to feedback prioritization information. Below these cards, there are sections for 'Search for Issues', 'Known Bugs', and 'Feature Suggestions', each with a 'Plan, Track, & Support' table listing various Jira products and their corresponding support links.

System Dashboard

Introduction

Welcome!

This is Atlassian's public issue tracker for [Jira](#), [Confluence](#), [Bitbucket](#), and other Atlassian products. If that is not what you were looking for, please see our [Community](#), [Documentation](#) and [Support](#) sites.

Search for Issues

When your idea or problem has already been reported, it's much better to add your vote rather than create a new issue.

If you already know your way around [Jira searches](#) and the [Jira Query Language \(JQL\)](#), then go straight to [Search](#).

New to Atlassian products and/or Jira? Use the links at right to get started.

When you locate an issue you wish to track, you can

Report a Bug

Thank you for taking the time to tell us! [Create an issue](#) in our support system and our Support engineers will confirm the problem, collect full details, and report it to development.

For more information about how we prioritize fixes, see our bug fix policies for [Server](#), [Cloud](#), and [Security](#).

Known Bugs

[Search for Issues](#)

Plan, Track, & Support

Jira Software Cloud	Jira Software Server
Jira Service Desk Cloud	Jira Service Desk Server
Jira Core Cloud	Jira Core Server
Portfolio for Jira Cloud	Portfolio for Jira Server

Suggest a Feature

To suggest a new feature, login or create an account then use the Create button in the header.

Suggestions can no longer be created for Hipchat and Stride as these were discontinued as of [February 2019](#).

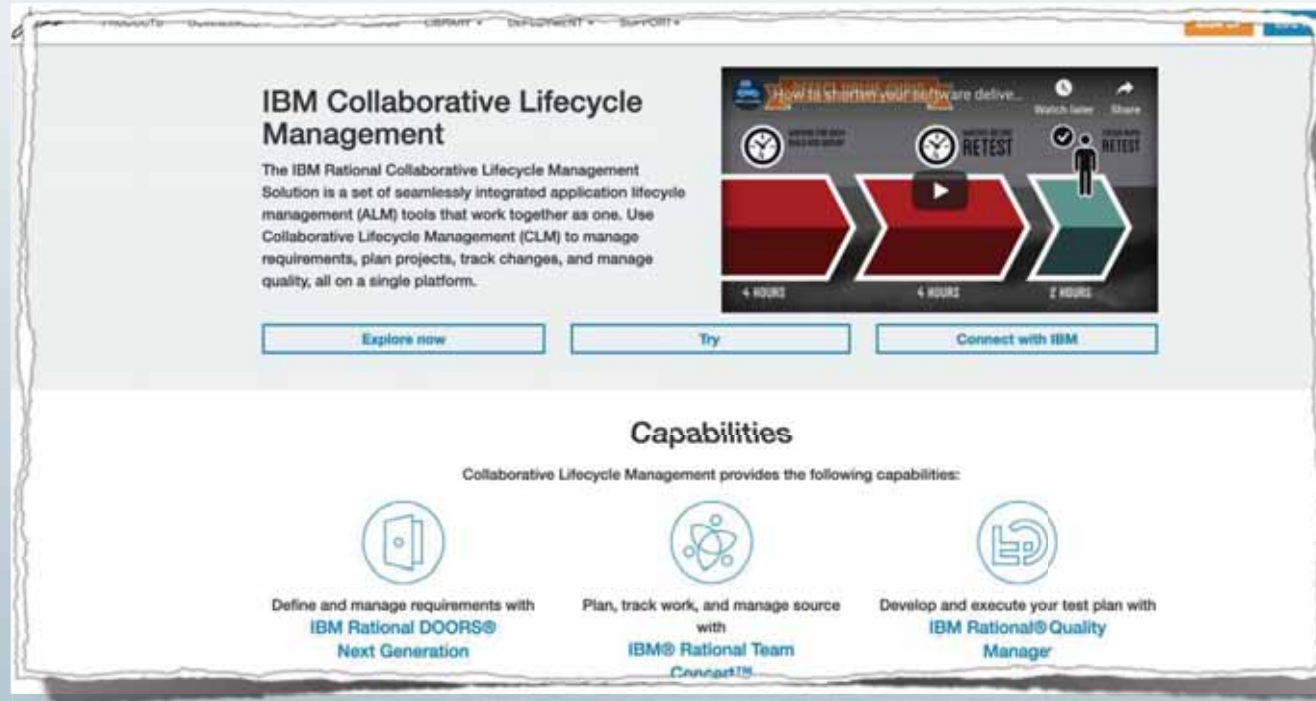
Want to know how we use your feedback? See [Prioritizing updates in Cloud, Server, and Data Center](#).

Feature Suggestions

Plan, Track, & Support

Jira Software Cloud	Jira Software Server
Jira Service Desk Cloud	Jira Service Desk Server
Jira Core Cloud	Jira Core Server
Portfolio for Jira Cloud	Portfolio for Jira Server

OPEN COMMERCIAL ECOSYSTEM



IBM Collaborative Lifecycle Management

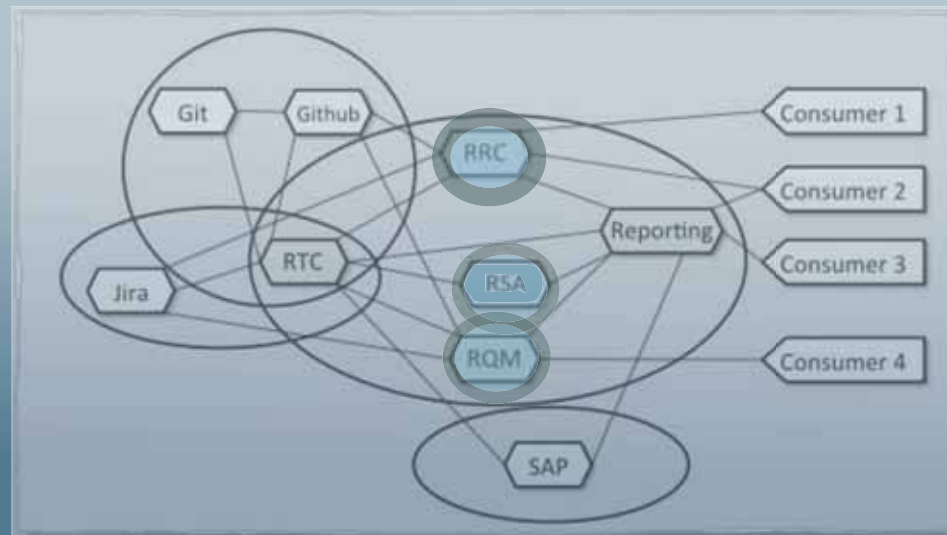
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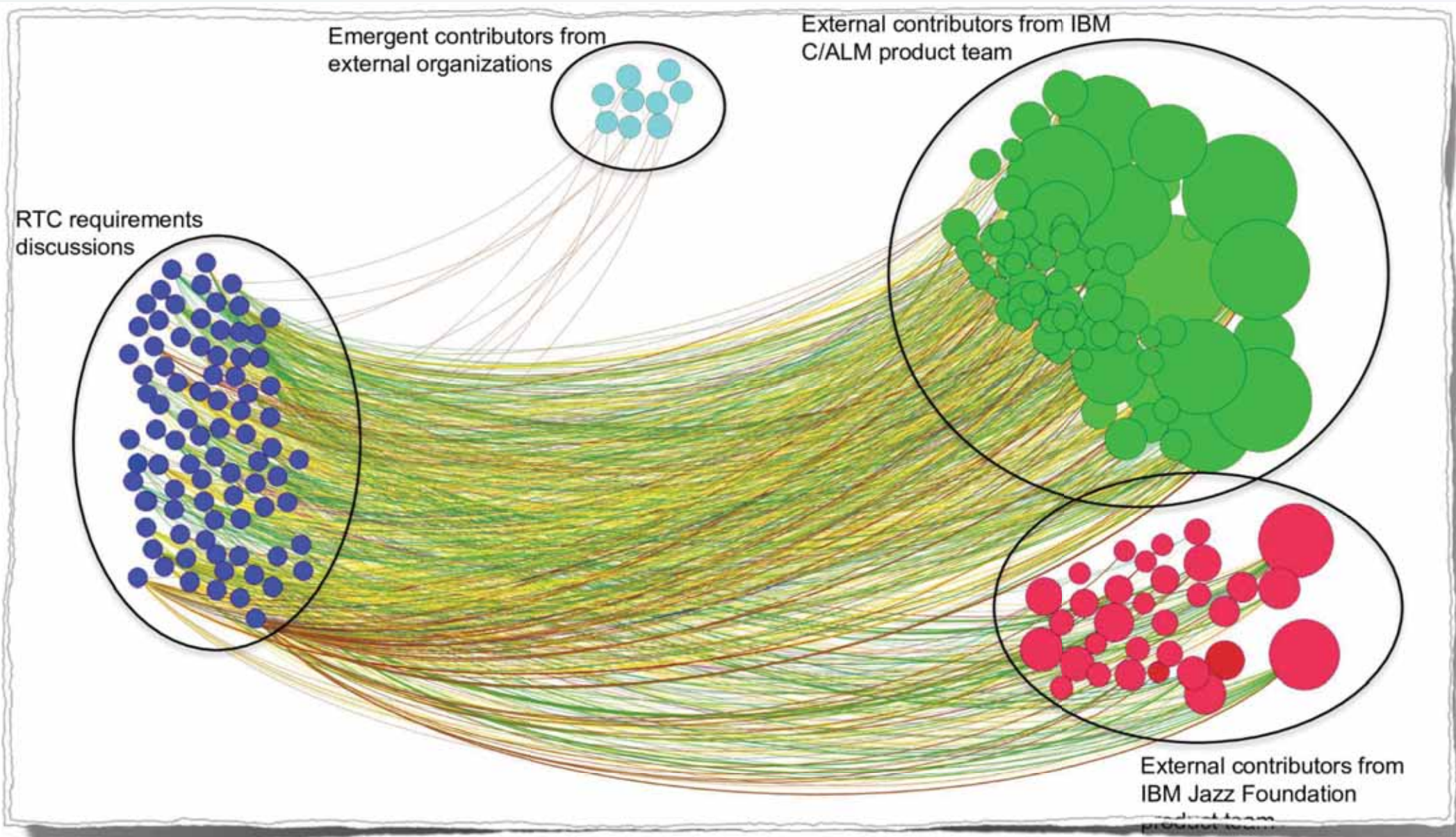
Explore now Try Connect with IBM

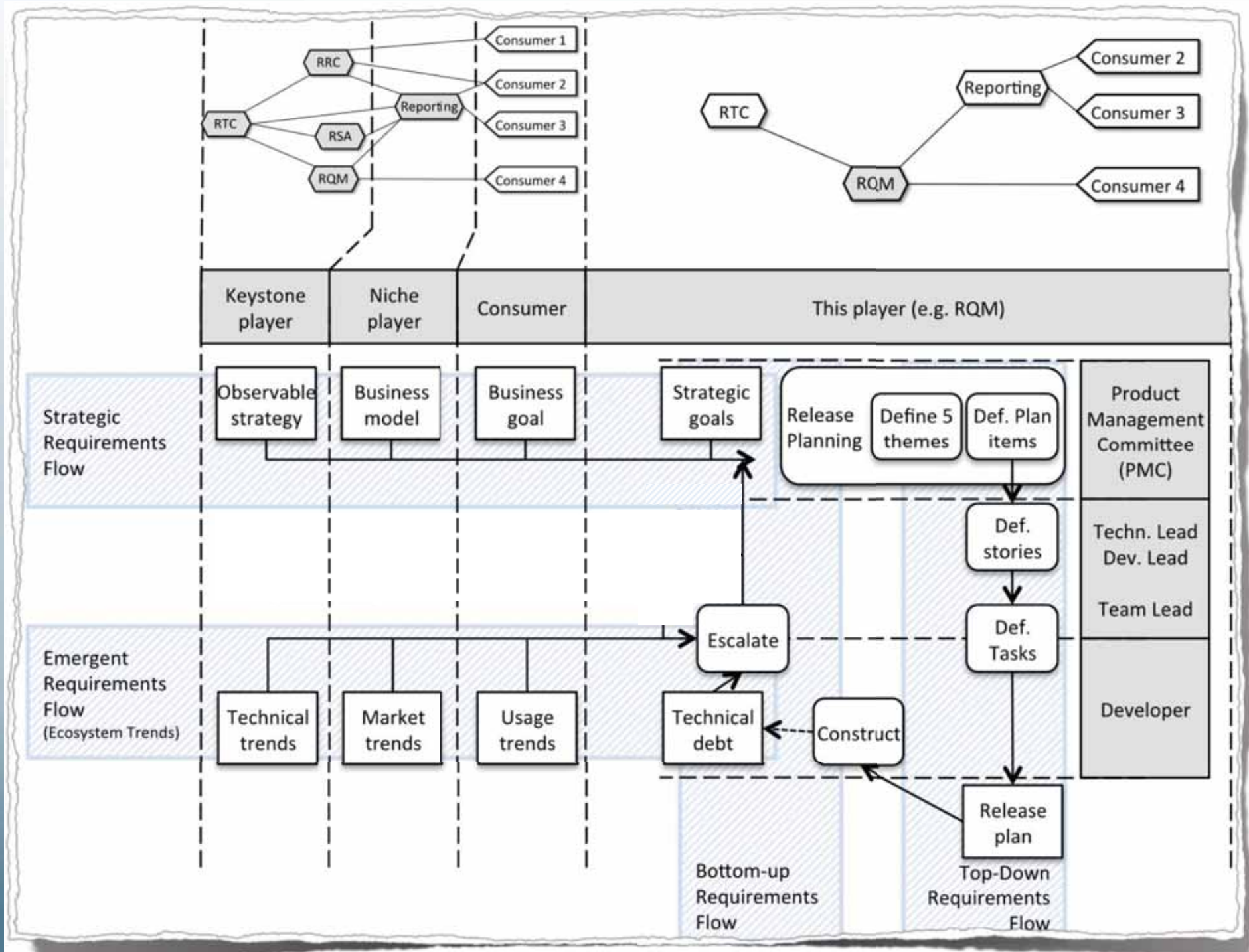
Capabilities

Collaborative Lifecycle Management provides the following capabilities:

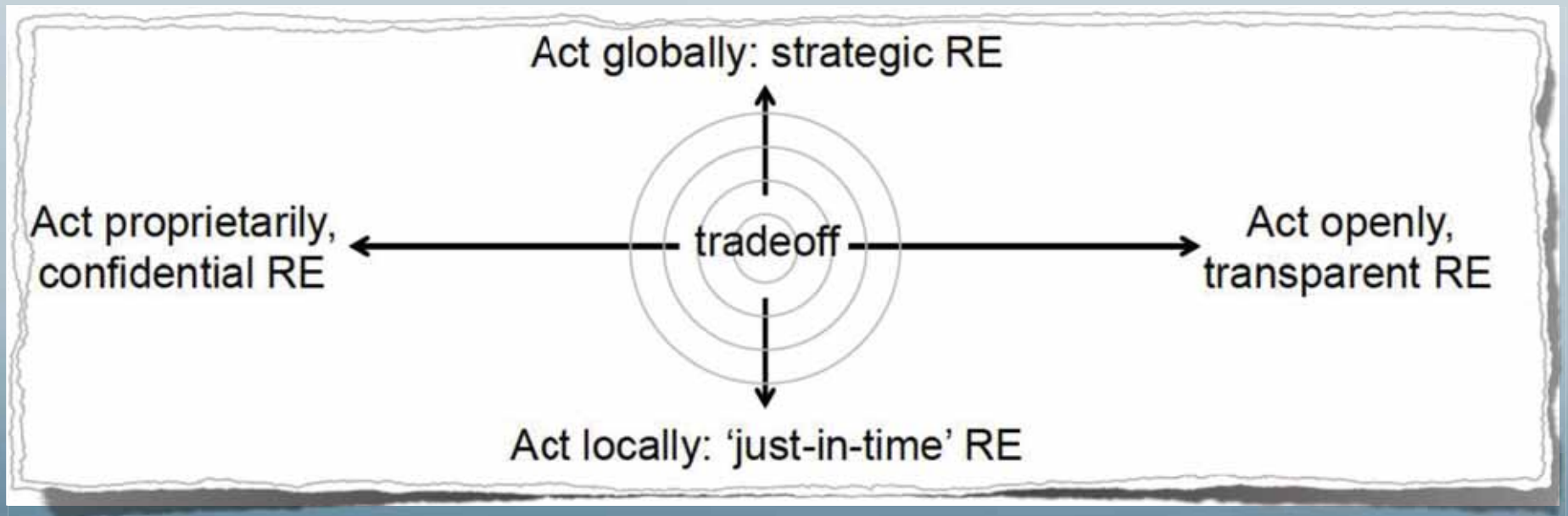
- Define and manage requirements with **IBM Rational DOORS® Next Generation**
- Plan, track work, and manage source with **IBM® Rational Team Concert™**
- Develop and execute your test plan with **IBM Rational® Quality Manager**







openness trade-offs



OPEN COMMERCIAL ECOSYSTEM

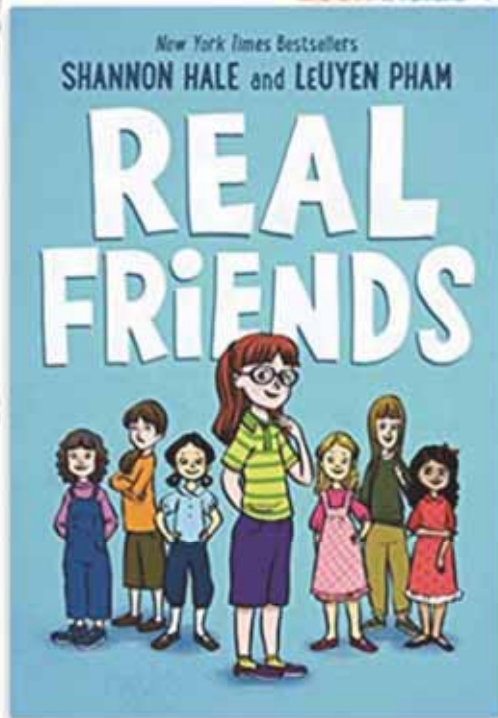
Closed source, open stakeholder communication,
corporate-led contributions,
inter-organizational partnerships

COLLABORATION AT SCALE

PROPRIETARY PLATFORMS



Look inside ↓



Real Friends Paperback – May 2 2017

by Shannon Hale (Author), LeUyen Pham (Illustrator)

★★★★☆ ▾ 19 customer reviews

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Kindle Edition
CDN\$ 10.99

Hardcover
CDN\$ 27.49

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Read with Our **Free App**

22 Used from CDN\$ 23.79
25 New from CDN\$ 23.79

21 Used from CDN\$ 10.28
31 New from CDN\$ 10.83

“Fresh and funny.” —*New York Times* Book Review

Newbery Honor author Shannon Hale and *New York Times* bestselling illustrator LeUyen Pham join forces in this graphic memoir about how hard it is to find your real friends—and why it’s worth the journey.

When best friends are not forever . . .

Shannon and Adrienne have been best friends ever since they were little. But one day, Adrienne starts hanging out with Jen, the most popular girl in class and the leader of a circle of friends called The Group. Everyone in The Group wants to be Jen’s #1, and some girls would do anything to stay

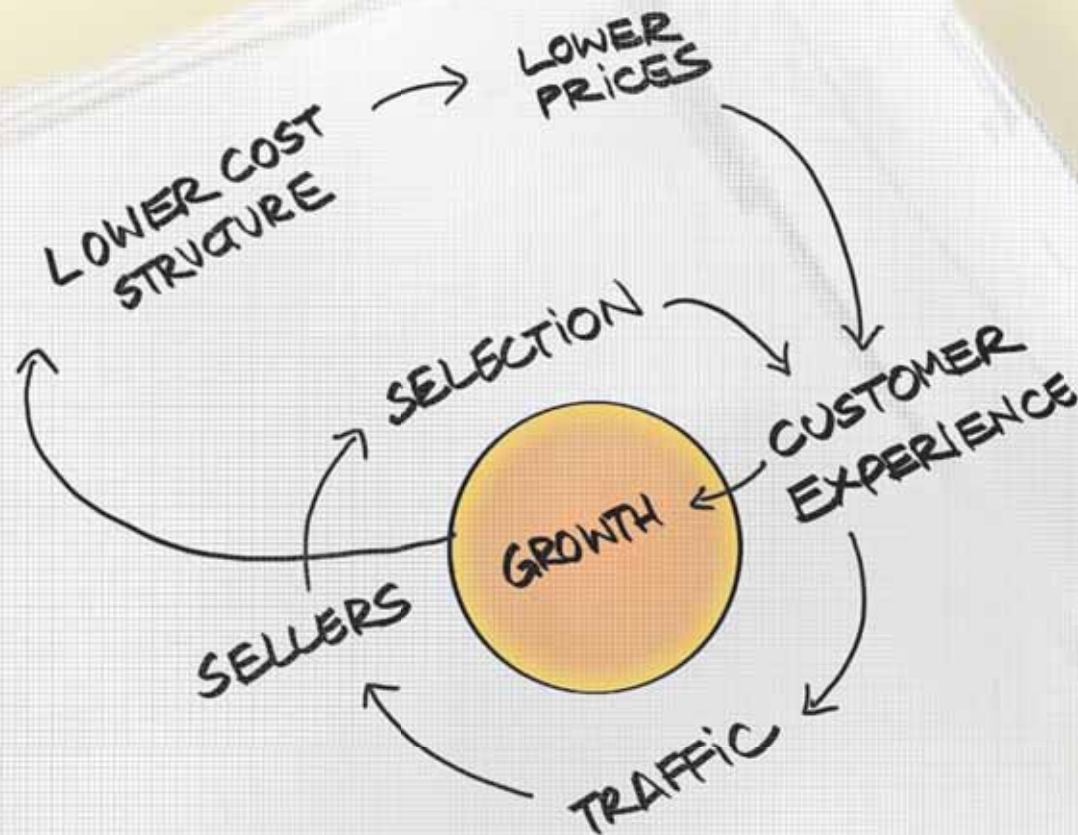
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See all images

amazon's VIRTUOUS CYCLE

THE POWER OF NETWORK EFFECTS FOR MEGA GROWTH



ORIGINAL: JEFF BEZOS

sketchplanations



Beautiful business

Free trial

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Accounting software with all the time-saving tools you need to grow your small business. Xero is secure and reliable and our experts are here to support you 24/7.

Try Xero for free



App marketplace

Explore 700+ time-saving apps that connect with Xero

🔍 Search app marketplace for apps, business types, functions

Featured apps

simPRO

Inventory, Invoicing + Jobs

simPRO

★★★★★ (40)

Your comprehensive software tool for Electrical, Plumbing, Security, Heat Pump, HVAC,

WorkflowMAX

Time Tracking, Invoicing + Jobs

WorkflowMax

★★★★★ (92)

A Xero product offering all-in-one workflow. Over 10,000 service businesses trust

vend

Inventory, Point of Sale

Vend

★★★★★ (98)

Run the world's best retail with point of sale & inventory software retailers love.

UNLEASHED

Inventory

Unleashed Software

★★★★★ (234)

Unleashed provides online inventory software for Xero, allowing accurate costs

TRADIFY

Time Tracking, Invoicing

Tradify

★★★★★ (94)

The complete job solution for tradie contractors. Easy

shopify

Start ▾

Sell ▾

Market ▾

Manage ▾

Pricing

Learn ▾

Log in

Start free trial

Build your business

You've got the will. We've got the way.

Start free trial



Every business is unique.
Find the app that's right for yours.

Search apps



Staff picks



by Shopify

by Shopify

by Ekoma

by NextSale

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Time Tracking, Invoicing

Tradify

★★★★★ (94)

The complete job solution for tradie contractors. Easy

from Product to Platform

providing the best products to developing the best
network of complementors (collaborators)

from Product to Platform

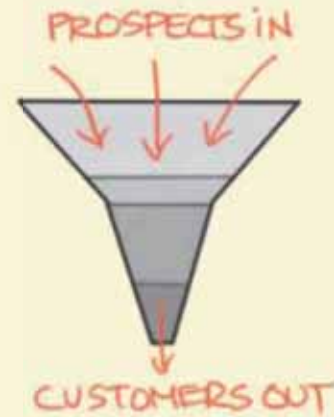
from end-user oriented to end-user and partner-oriented

THE BUSINESS FLYWHEEL

A BETTER METAPHOR TO VISUALIZE YOUR BUSINESS

From the FUNNEL

CUSTOMER ENERGY IS
LOST AT THE BOTTOM.
YOU START FRESH WITH
EACH NEW SET.

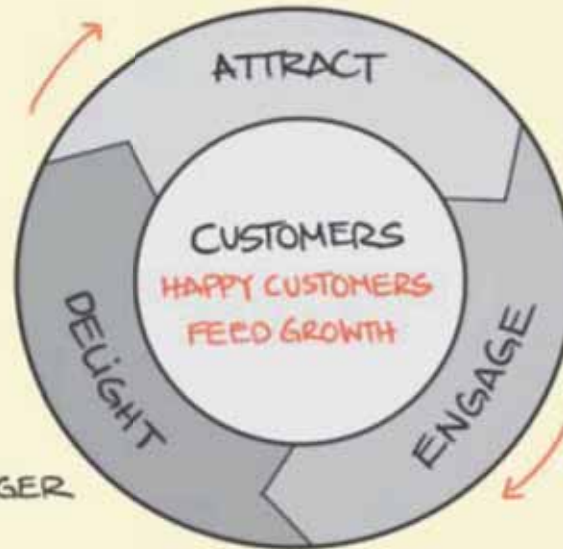


To the FLYWHEEL

CUSTOMER ENERGY
AND MOMENTUM
IS HARNESSSED.
REDUCE FRICTION TO
SPIN FASTER

HAPPY
CUSTOMERS > SPEED
YOU UP

MORE
CUSTOMERS > MAKE THE
WHEEL BIGGER



from Product to Platform

from self-reliant to team player

from Product to Platform

shared risk management in developing software

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★★★★★ (94)

The complete job solution for tradie contractors. Easy



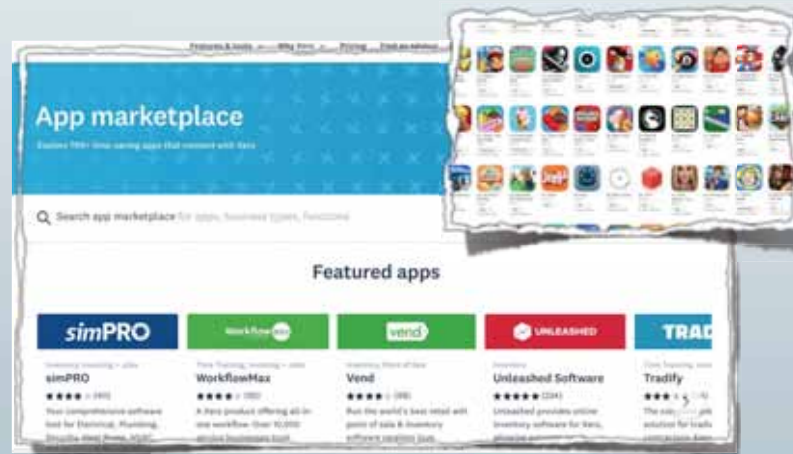


CANADIAN STARTUP NEWS & TECH INNOVATION

BY DOUGLAS SOLTYS / CANADIAN STARTUP NEWS / JULY 31, 2018

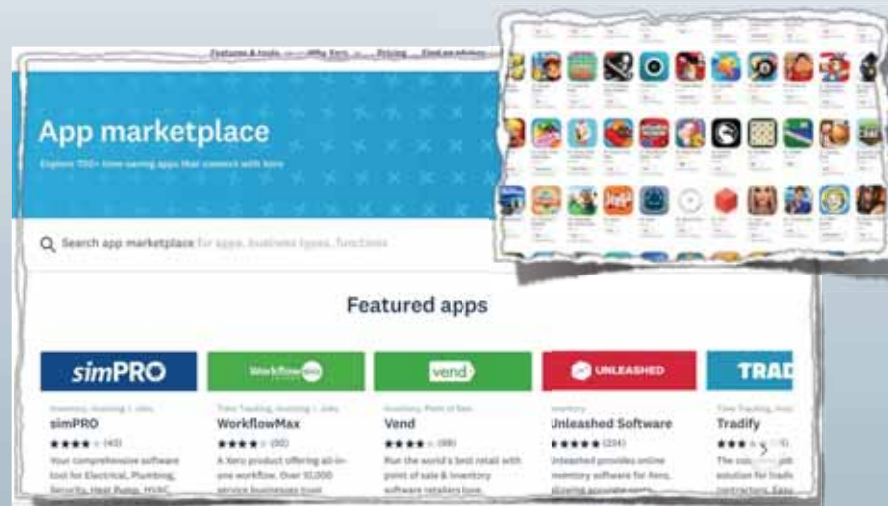
XERO ACQUIRES TORONTO'S HUBDOC FOR \$70 MILLION USD





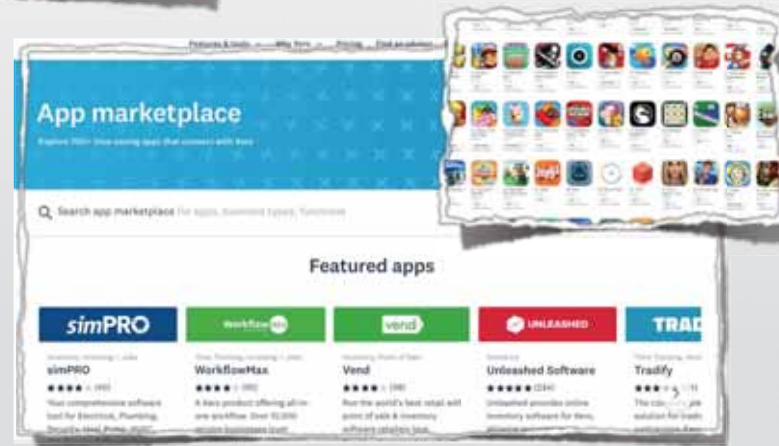
Open API platform ecosystem,
self-regulated community contributions,
inter-organizational partnerships

strategic governance



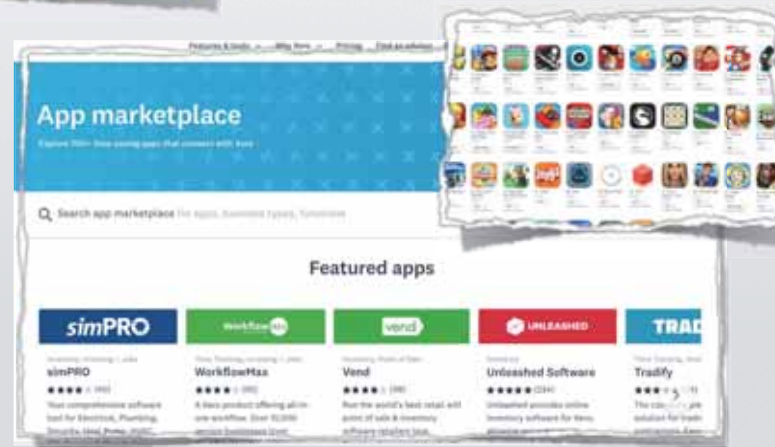
quality of integrations

platform innovation to enable
external product innovation



OPEN COLLABORATION AND INNOVATION AT SCALE

COLLABORATIVE INNOVATION



CO-INNOVATION AT LARGE SCALE

A RESEARCH AGENDA

Models of innovation within different types of ecosystems



Ecosystem tradeoffs and implications for Software Engineering
platform openness <--> quality of integrations



THANK YOU





THANK YOU

Daniela Damian
University of Victoria

2018-2019 Distinguished Speaker Series
Institute for Software Research,
University of California - Irvine
April 12, 2019