

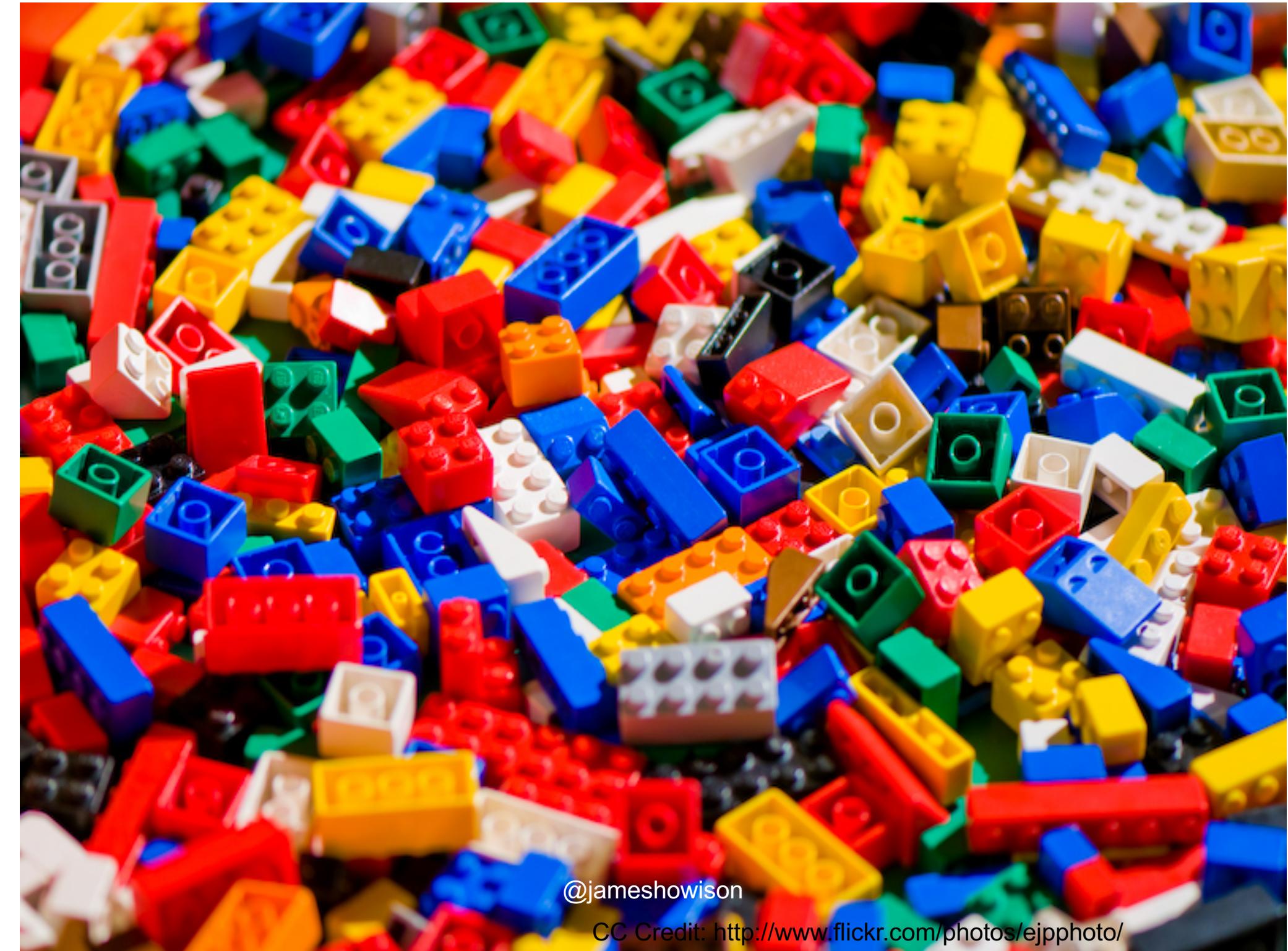


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James Howison  
(with Kevin Crowston)

# Collaboration through Open Superposition: A theory of the open source way

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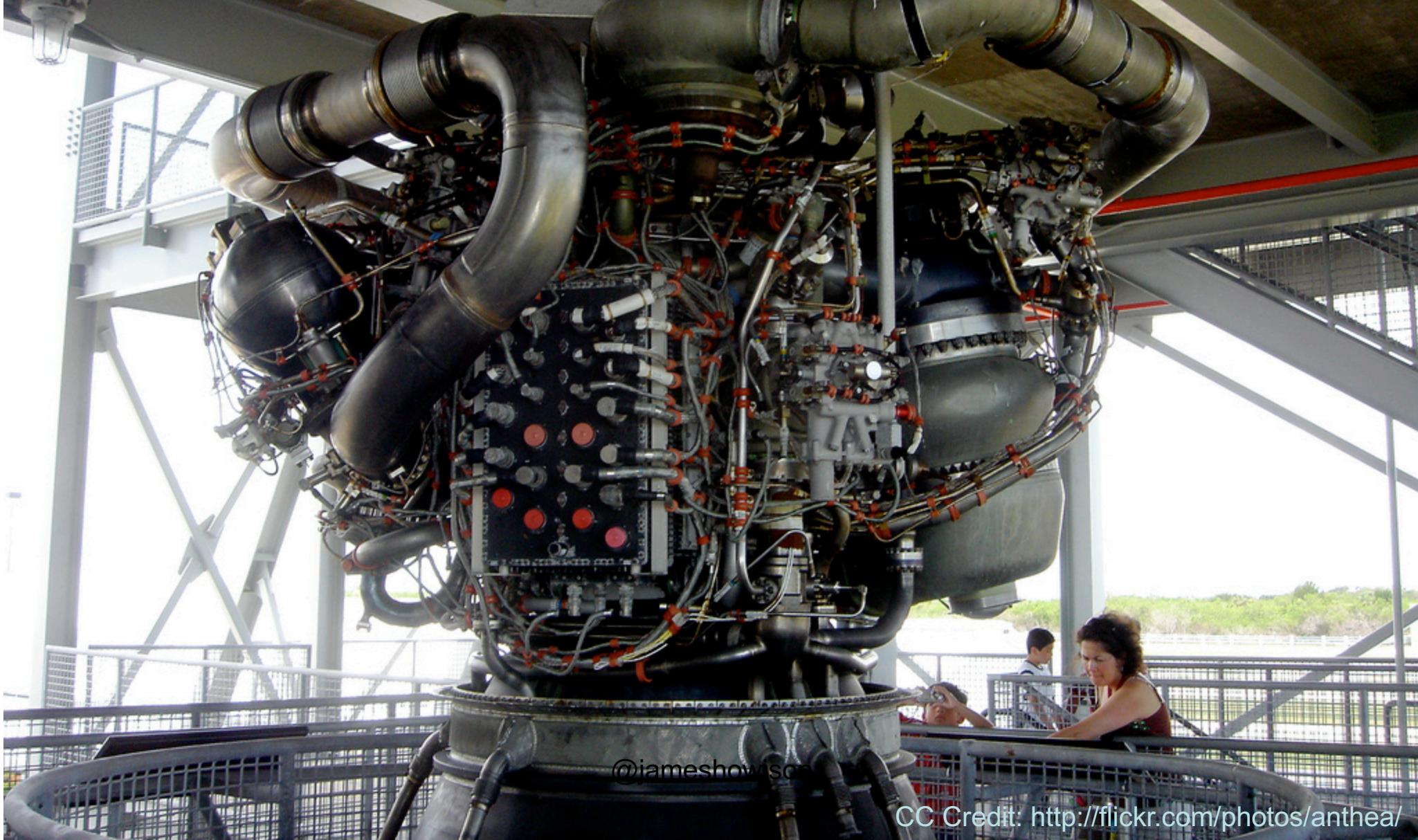


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# A research arc

- Participant Observation
  - one case
  - participation and observation
- Replication
  - two cases chosen by replication logic
  - Study of project archives
- Candidate theory development
  - Develop candidate theory and demonstrate it's usefulness

Goal:  
An image of FLOSS production



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# Discovery through Participant Observation

ConsolidatedBibFiles.bib

Search Bibliography

Read	First Author	Year	Title	Container	Added
<input type="checkbox"/>	Royer, Loïc	2008	Unraveling Protein Networks with Power Graph Analysis	PLoS Comput Biol	2008-08-12
<input type="checkbox"/>	Howison, James	2008	Cross-repository data linking with RDF and OWL. Tow...	Proc. of WoPDAoSD (Workshop o...	2008-08-18
<input type="checkbox"/>	Pajunen, Kalle	2008	Institutions and inflows of foreign direct investment: a...	J Int Bus Stud	2008-08-24
<input type="checkbox"/>	Jackson, Gregory	2005	Employee Representation in the Board Compared: A F...	Industrielle Beziehungen	2008-08-24
<input type="checkbox"/>	Kogut, B.	2004	Prototypes and Strategy: Assigning Causal Credit Usin...	European Management Review	2008-08-24
<input type="checkbox"/>	Schneider, Carsten Q	2006	It might look like a regression equation ... but it's not!...	Proceedings of Comparative Po...	2008-08-24
<input type="checkbox"/>	Weick, K. E.	1989	Theory construction as disciplined imagination	Academy of Management Review	2008-09-26
<input type="checkbox"/>	Weick, Karl E.	1995	What Theory is Not, Theorizing Is	Administrative Science Quarterly	2008-09-26
<input type="checkbox"/>	DiMaggio, Paul J.	1995	Comments on "What Theory is Not"	Administrative Science Quarterly	2008-09-26
<input type="checkbox"/>	Sutton, Robert I.	1995	What Theory is Not	Administrative Science Quarterly	2008-09-26
<input type="checkbox"/>	Glaser, B. G.	1978	Theoretical sensitivity: Advances in the methodology ...		2008-10-13
<input type="checkbox"/>	Patton, M. Q.	2002	Qualitative research and evaluation methods		2008-10-13
<input type="checkbox"/>	Rowan, Glenn A.	2006	Grounded Theory and Sensitizing Concepts	International Journal of Qualita...	2008-10-13

**Theory construction as disciplined imagination**  
Weick KE. *Academy of Management Review*. 1989;14:516 –531.  
(weick1989theory-construc, article)

**What Theory is Not, Theorizing Is**  
Weick KE. *Administrative Science Quarterly*. 1995;40(3):385-390.  
(weick1995what-theory-is-, article)

1128 publications

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# Task: The Container Column

ConsolidatedBibFiles.bib

Search Bibliography

Group	Read	First Author	Year	Title	Container	Added
Library	1128	Royer, Loïc	2008	Unraveling Protein Networks with Power Graph Analysis	PLoS Comput Biol	2008-08-12
Web	15	Howison, James	2008	Cross-repository data linking with RDF and OWL. Tow...	Proc. of WoPDA5D (Workshop o...	2008-08-18
dynamicSNA	46	Pajunen, Kalle	2008	Institutions and inflows of foreign direct investment: a...	J Int Bus Stud	2008-08-24
Howison	46	Jackson, Gregory	2005	Employee Representation in the Board Compared: A F...	Industrielle Beziehungen	2008-08-24
Recent Articles	3	Kogut, B.	2004	Prototypes and Strategy: Assigning Causal Credit Usin...	European Management Review	2008-08-24
Cite Marks (2001)	12	Schneider, Carsten Q	2006	It might look like a regression equation ... but it's not!...	Proceedings of Comparative Po...	2008-08-24
Cite van de van 1976	16	Weick, K. E.	1989	Theory construction as disciplined imagination	Academy of Management Review	2008-09-26
Cite Yates Genre	21	Weick, Karl E.	1995	What Theory is Not, Theorizing Is	Administrative Science Quarterly	2008-09-26
CiteOrlikChange	19	DiMaggio, Paul J.	1995	Comments on "What Theory is Not"	Administrative Science Quarterly	2008-09-26
Episodes + Attention	2	Sutton, Robert I.	1995	What Theory is Not	Administrative Science Quarterly	2008-09-26
ForIISeminar	12	Glaser, B. G.	1978	Theoretical sensitivity: Advances in the methodology ...		2008-10-13
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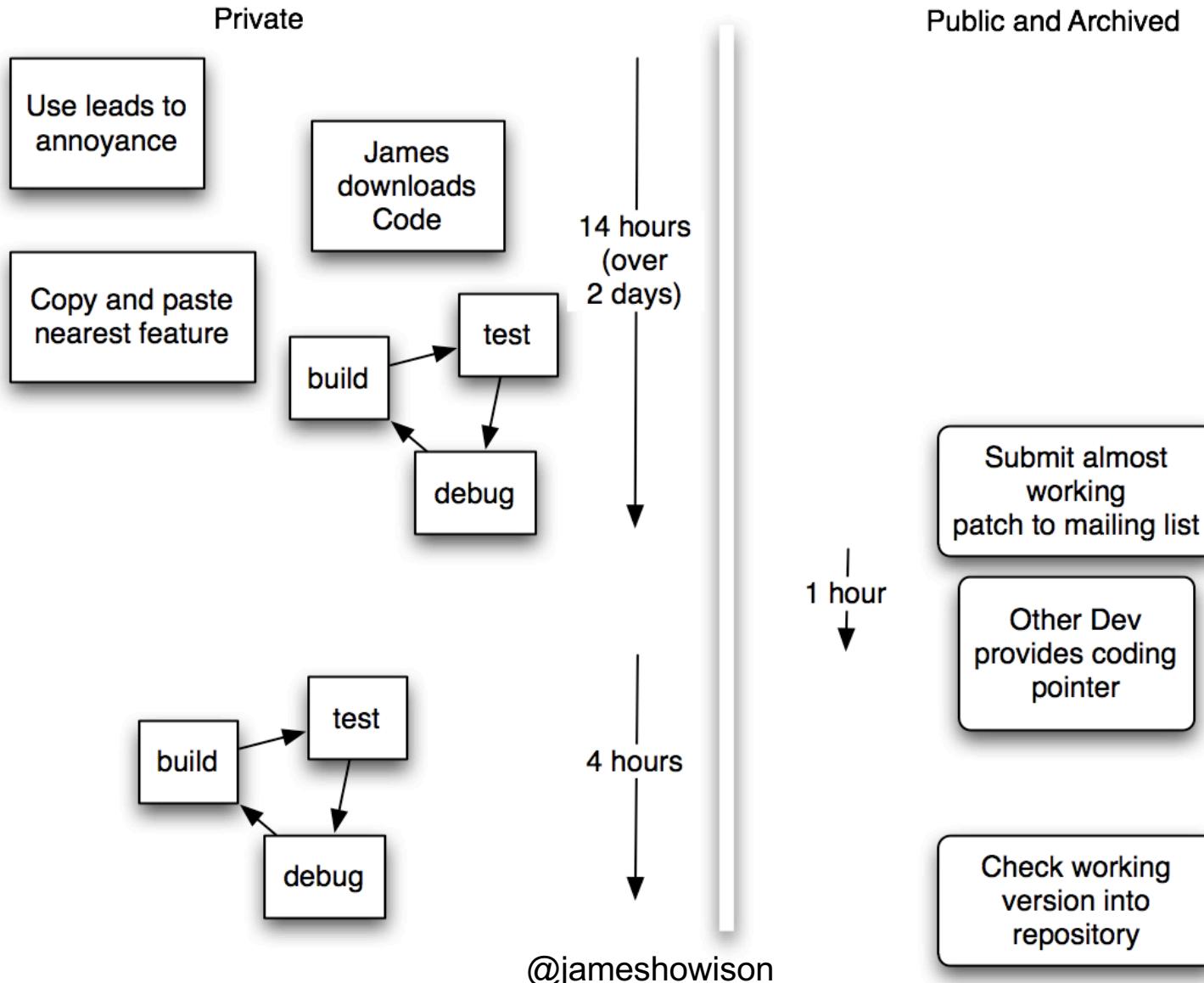
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# How it was built



# BibDesk 2.0?

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# Task: “Web Groups”

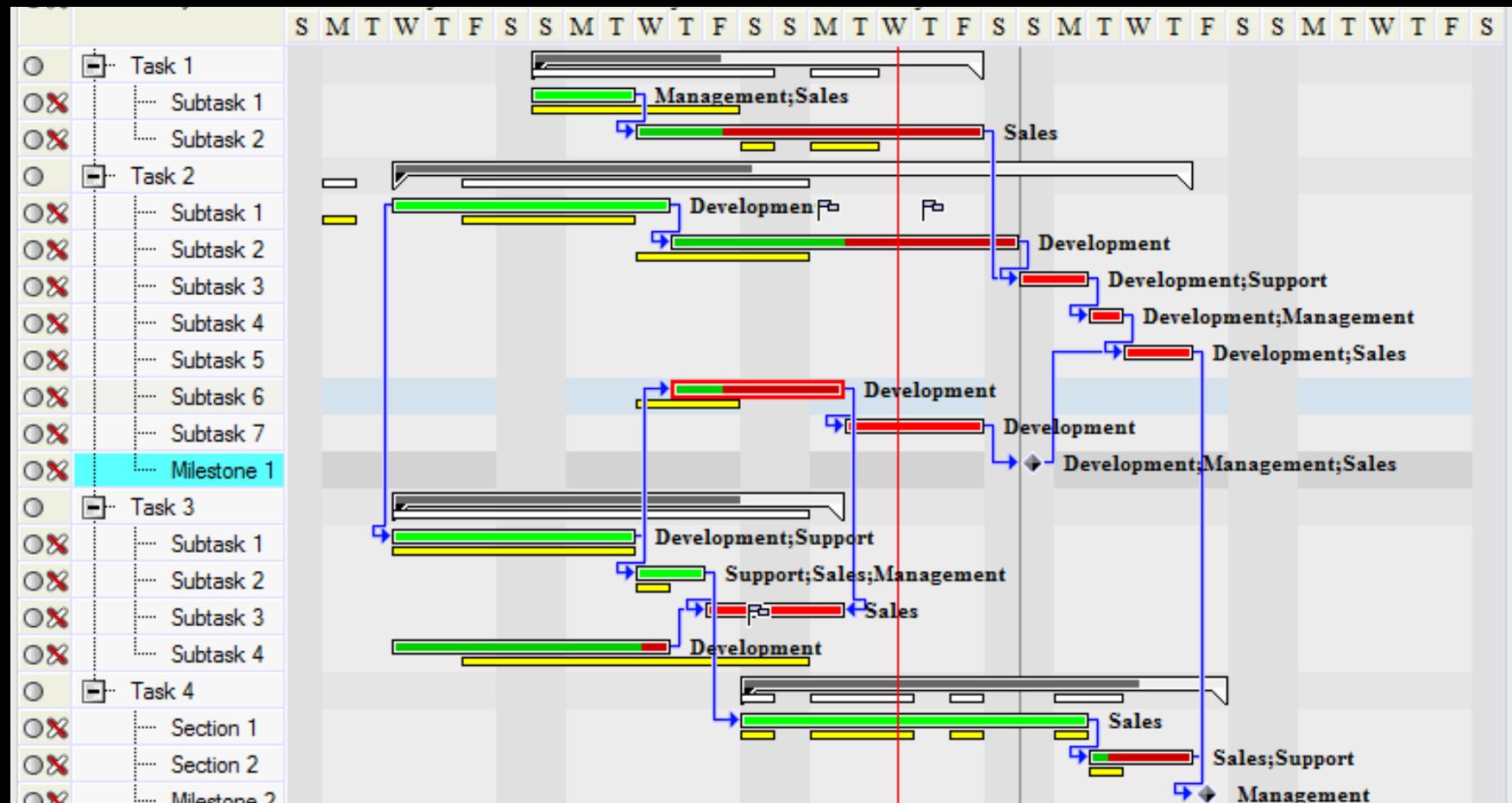
June 2003 (Email)

*I really want to use this, but the conditions have never quite been right - either I was waiting for ... RSS+RDF (now looks like it'll never happen) or ... an XML bibliographic file format ... (could happen now, but I ran out of free time).*

[https://sourceforge.net/mailarchive/message.php?msg\\_id=DF0FB757-56BA-45D7-A1EA-262EB7A5B3DC@mac.com](https://sourceforge.net/mailarchive/message.php?msg_id=DF0FB757-56BA-45D7-A1EA-262EB7A5B3DC@mac.com)

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# What didn't happen



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Image Credit:  
TreeGrid.com marketing materials

# Task: “Web Groups”

June 2003 (Email)

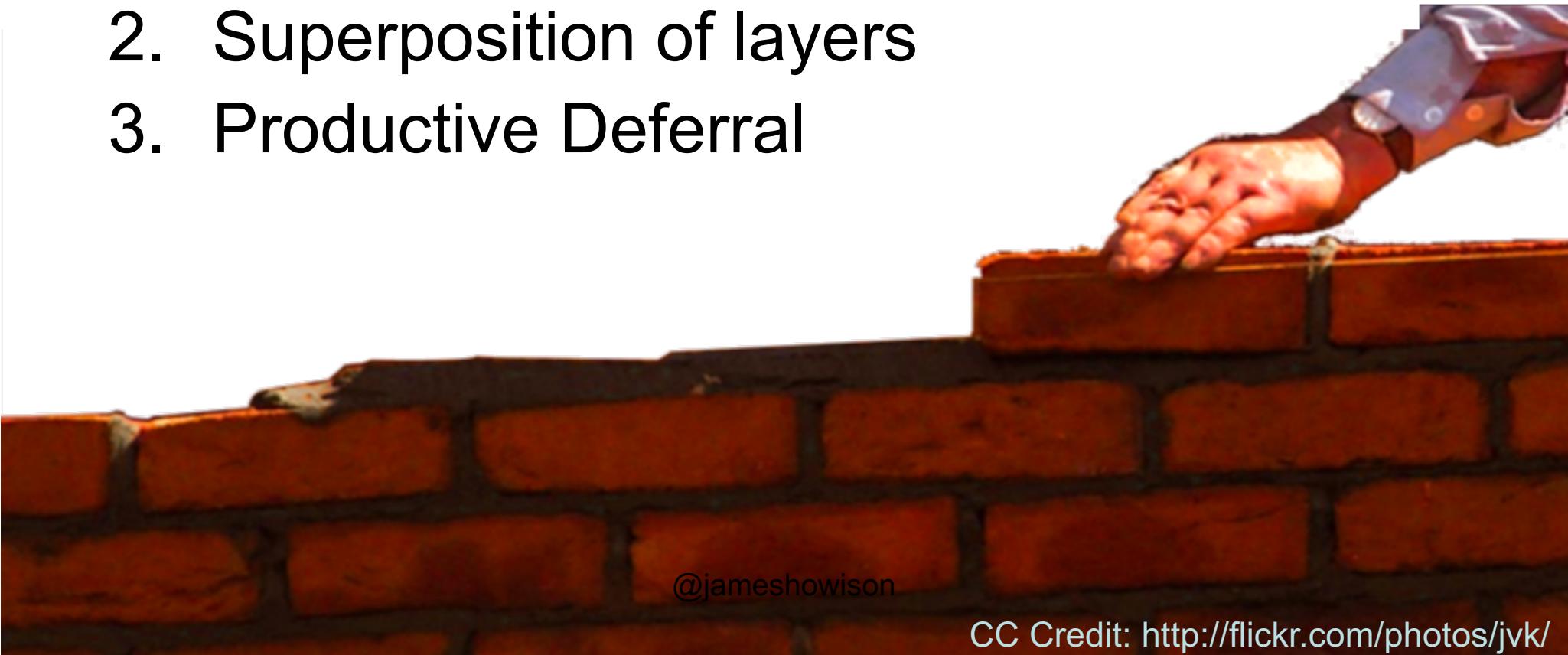
*I really want to use this, but the conditions have never quite been right - either I was waiting for ... RSS+RDF (now looks like it'll never happen) or ... an XML bibliographic file format ... (could happen now, but I ran out of free time).*

Jan 2007 (Email with patch):

*It was much easier than I expected it to be because the existing groups code (and search groups code) was very easy to extend. Kudos - I wouldn't have tried it if so much hadn't already been solved well.  
Thanks!*

# Discovery Findings

1. Individual work with personal motivations
2. Superposition of layers
3. Productive Deferral



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# But that's just one case!

*(and what's the point of theorizing  
about idiosyncratic situations?)*

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# To the Archives!

The evidence is here, somewhere.

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# Replication: Fire and Gaim

- Specific RQs:
  - What proportion of work was individual?
  - Any evidence of “productive deferral”?
- Fire and Gaim
  - Multi-protocol instant messaging clients
  - Community-based open source
  - Similar task and collaboration infrastructure to BibDesk

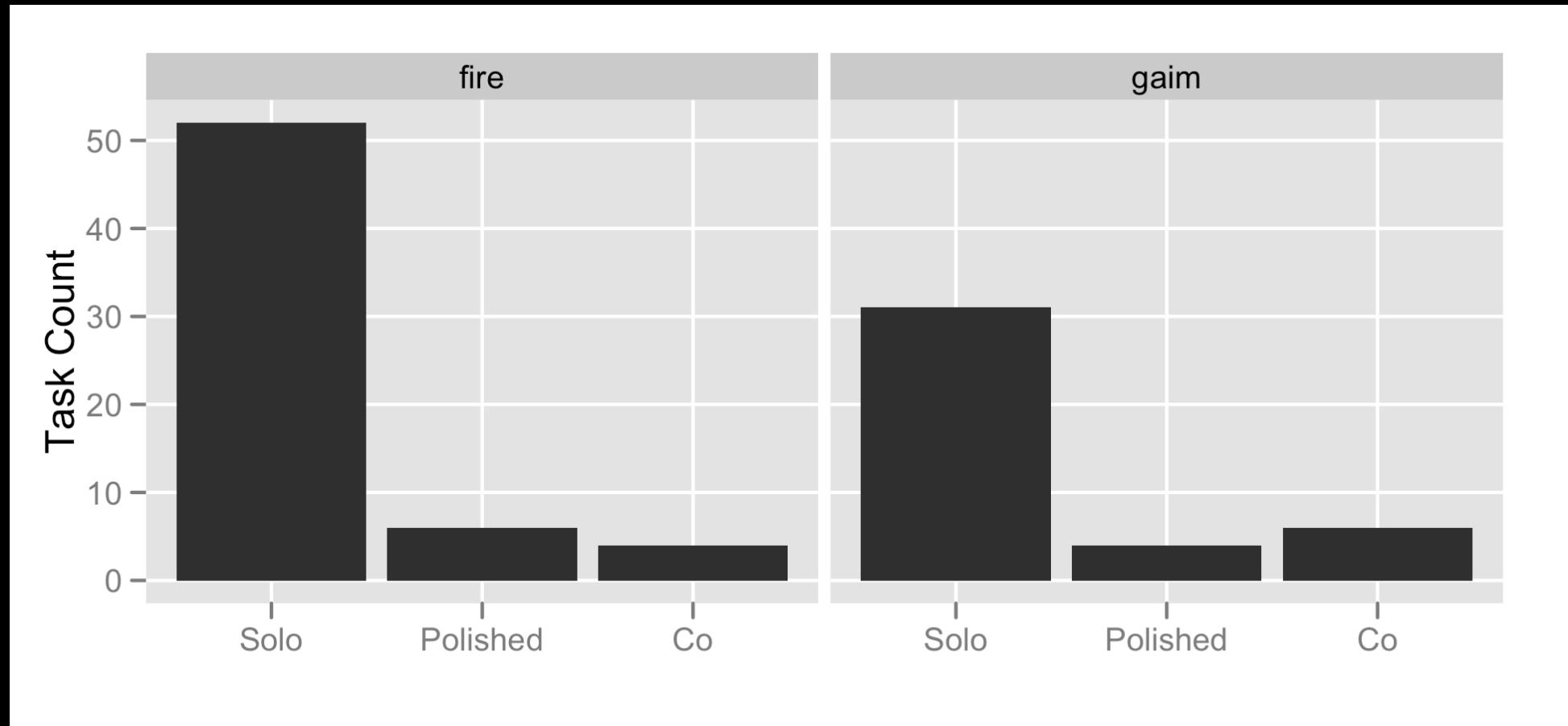
# Illustrative Co-work

#	Date/Gap	Actor (overall role)	Action	Code Applied
<b>Gaim Task 2: manual browser security fix</b>				
1	Jul 20 2002	kareemy (user)	reports bug	Use Info. Provision
2	1D 5h 50m	lschiere (dev)	attempts diagnosis	Code Info. Provision
3	(undated)	robot101 (p dev)	writes patch	Core Production
4	20D 9h 41m	seanegan (dev)	checks in patch	Review
5	10D 18h 10m	seanegan (dev)	tweaks fix	Polishing Prod.
6	1D 20h 8m	chipx86 (dev)	re-writes fix	Core Production
7	1D 3h 20m	seanegan (dev)	move fix to branch	Management Work

# Illustrative Individual Work

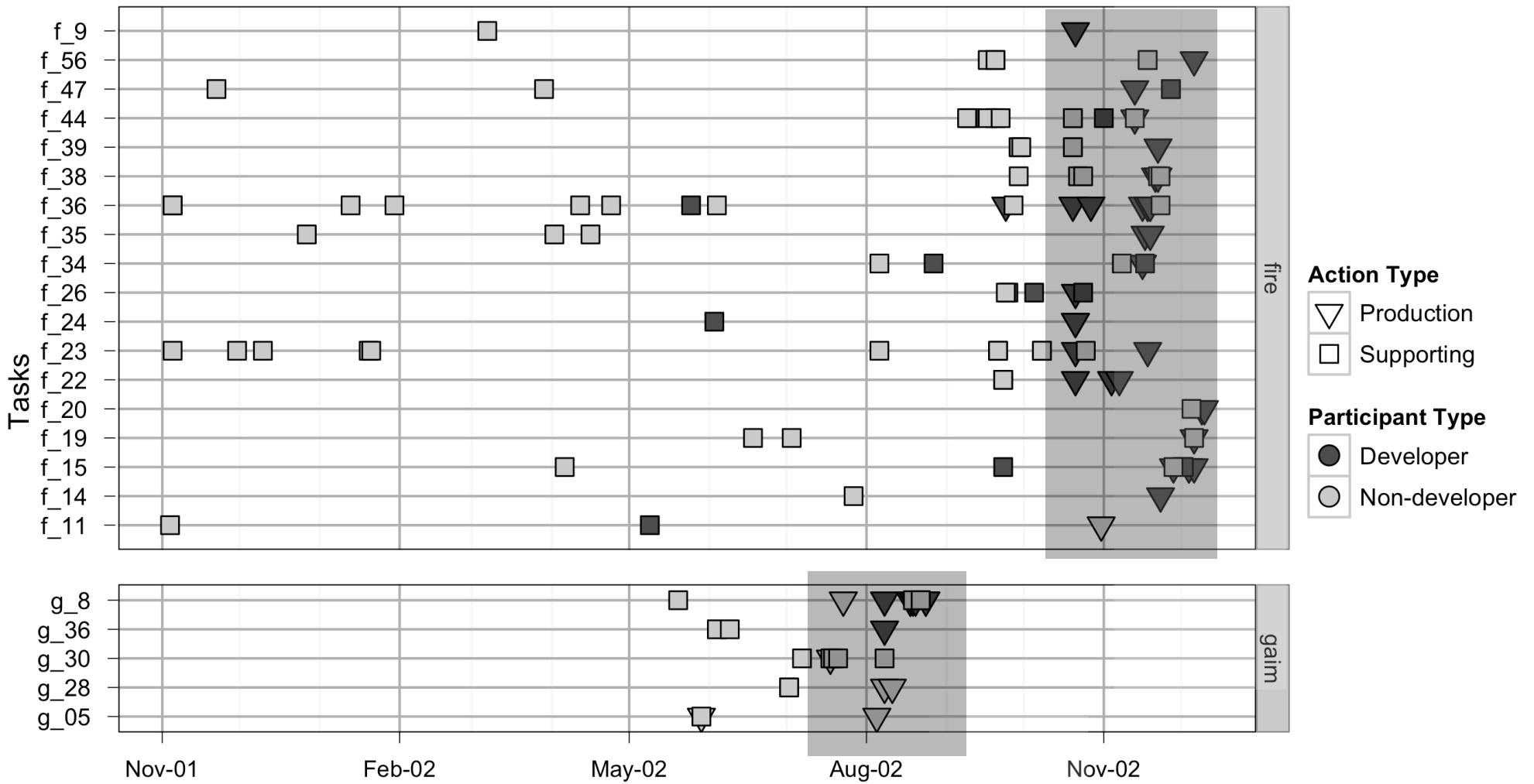
#	Date/Gap	Actor (overall role)	Action	Code Applied
<b>Fire Task 57: user list duplicate px</b>				
1	Dec 06 2002	gbooker (dev)	fixes bug	Core Production
<b>Gaim Task 3: iconv library integrated</b>				
1	Aug 02 2002	seanegan (dev)	adds library	Core Production
2	19m 52s	seanegan (dev)	changes ChangeLog	Documenting Work
3	26m 10s	seanegan (dev)	integrates library	Core Production
<b>Fire Task 5: scroll on PgUp</b>				
1	Nov 19 2002	nkocharh (p. dev)	makes PgUp scroll	Core Production
<b>Fire Task 29: AIM buddy icons</b>				
1	Oct 27 2002	gbooker (dev)	checks in buddy icon code	Core Production
2	(same time)	gbooker (dev)	changes ChangeLog	Documenting Work
3	39m 3s	gbooker (dev)	add jpg icons	Polishing
4	1h 22m	gbooker (dev)	add bitmap icons	Polishing
5	12h 1m	gbooker (dev)	.buddyicon save	Polishing
6	1h 22m	gbooker (dev)	add bitmap icons	Polishing
7	3D 13h 1m	gbooker (dev)	fix IRC icons	Polishing
8	3D 18h 34m	gbooker (dev)	fix memory leak1	Polishing
9	1h 6m 23s	gbooker (dev)	fix memory leak2	Polishing
<b>Gaim Task 18: Finnish Translation (Reviewed Solo)</b>				
1	(unknown)	teroajk (trans.)	writes Finnish trans.	Core Production
2	Jul 02 2002	robflynn (dev)	checks in trans.	Review Work
3	(same time)	robflynn (dev)	thanks teroajk	Management Work

# Tasks were individual



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# Evidence for Deferral



# An image of FLOSS production: Open Superposition

- Work is done in Tasks that are
  - Individual
  - Short
  - Layered
- Complex work is often deferred
  - Until it is easier (doesn't always happen!)

Other types of work build on this base

# To be explained

1. Why are these patterns of work observed?
2. How can complex software result from this way of working?
3. Under what socio-technical contingencies is this likely to be successful?

# Why these patterns of individual work and deferral?

- Fewest dependencies, lowest coordination challenges and costs
- Closest match to motivational situation of FLOSS participants.
  - Increases autonomy without eliminating relatedness
    - Ke and Zhang (2010), Ryan and Deci (2000)

# (Inter)dependency

Relying on each other to achieve together

- Long history of taxonomies of dependency types:
  - Thompson: Sequential, Pooled, Reciprocal
  - Crowston/Malone: shared resource, producer-consumer, common object ...

# Forwards and Backwards

- Forwards dependency:
  - Depending on something that does not yet exist
  - e.g., Building a leg of a table
- Backwards dependency:
  - Depending on something that already exists
  - e.g., Building a replacement table top

# Functional and Motivational

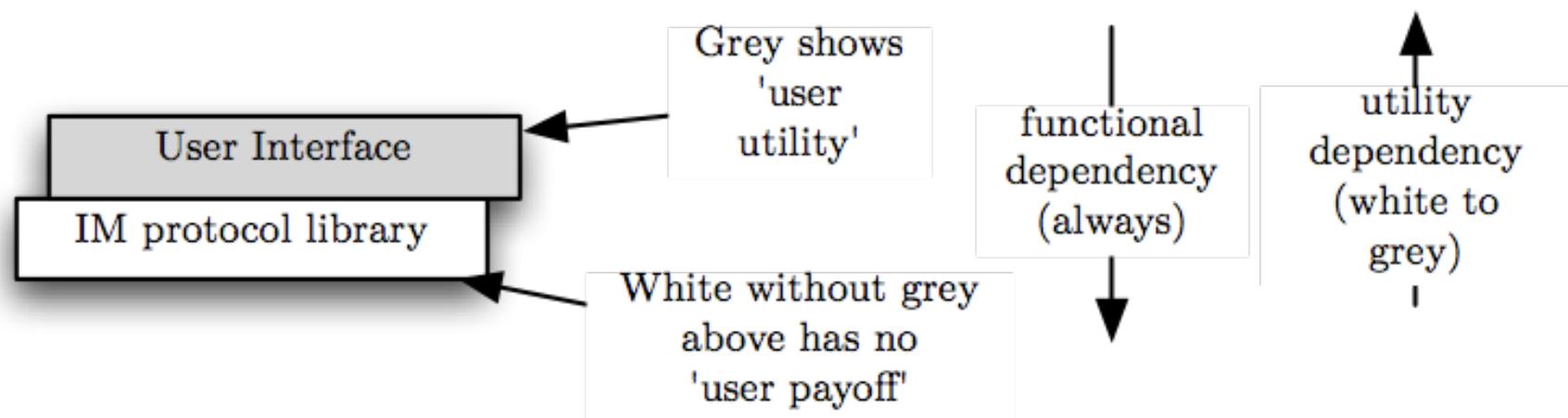
- Functional dependency:
  - Something else is needed for a product to work
- Motivational dependency:
  - Something else is needed for the work to be worthwhile (sufficiently motivating)

# Superposition

*The process of laying down motivationally independent layers, extending an existing, functioning artifact.*

- Contain only backwards dependencies
  - Functionally: building on what's already working
  - Motivationally: the work has immediate pay-offs

# A model of software development



# Ok, but can this *really* work?

- Software development is highly complex, interdependent, work  
(e.g., Herbsleb et al. 2001))
- Can such simple steps really get the job done?

# Imagine trying to plan this

1. Identify desired outcomes (design)
2. Design a task sequence that reaches them
3. Find people who are:
  - Motivated to do each task
  - Able to do each task
  - At just the right time

*Crippling search costs!*

# Application-led search

- Openness and availability of application
- Task identification through situated use  
(e.g., Suchman 1987)

*“Porches fill in by stages, not all at once, you know. ... it happens that way because [the family] can always visualize the next stage based on what’s already there”*

(Brand 1995, quoting an architect)  
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# But why does deferral make things easier?

- Layered tasks makes deferral *more likely* to be productive
- Small layers can compose in different ways. They provide option value.  
(e.g., Baldwin and Clark 2001)
- Small layers are easier to understand, especially over time.  
(e.g., Dabbish, 2011; Boudreau et al 2011)

# Contingencies for Open superposition

- Attributes of object of work
  - Layerability
  - Low instantiation costs
  - Low distribution costs
- Irrevocable openness
- Time

# Layers vs Steps



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# Irrevocable openness



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*Free and Open Source Licenses prevent this.*

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# Npm “kik” rage quit



Photo illustration by Aurich Lawson

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# Time == Money

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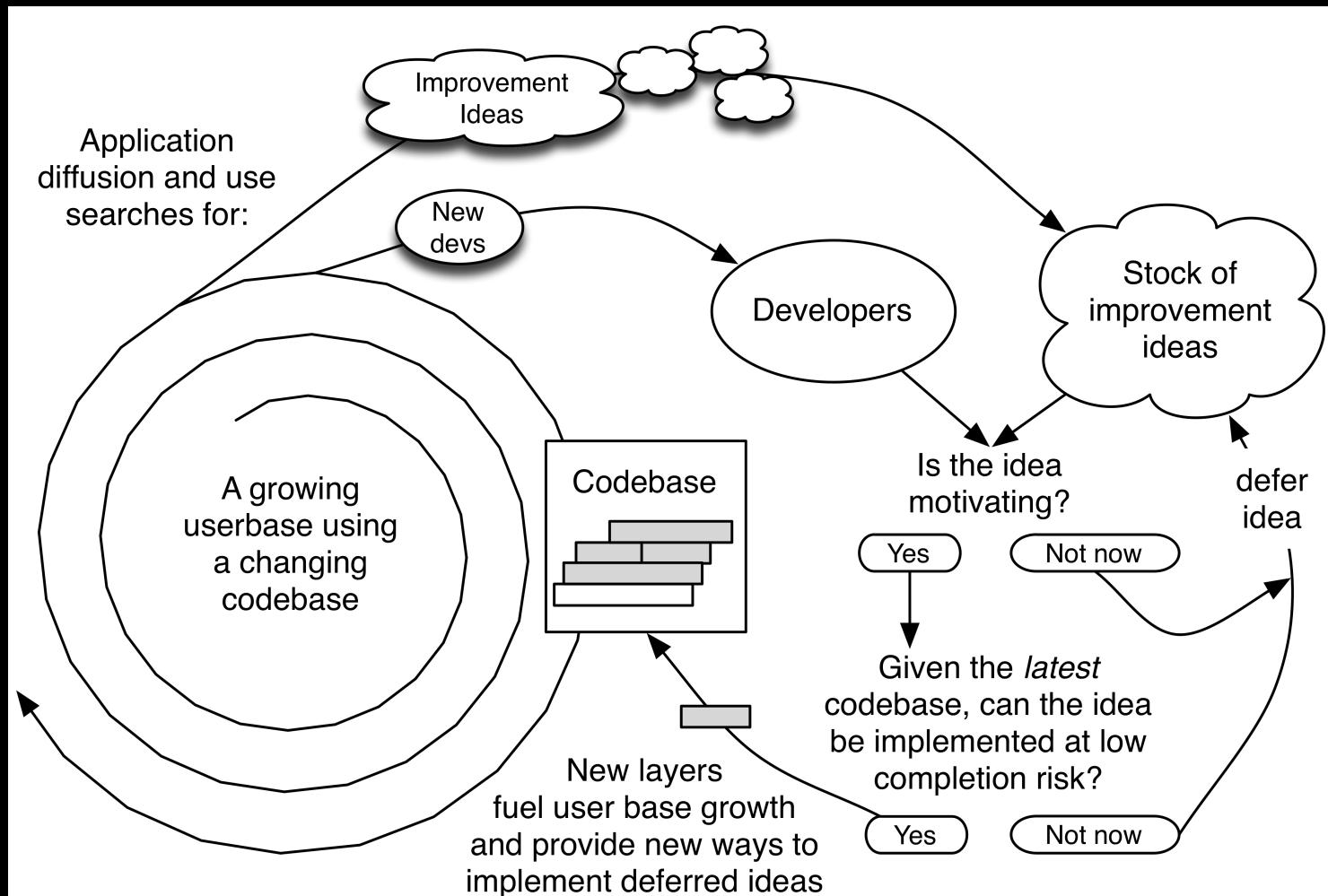
<http://www.flickr.com/photos-opacity/1600562651/>



*This guy hates to wait*

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# Open Superposition



Howison, J., & Crowston, K. (2014). Collaboration through open superposition: A theory of the open source way. *MIS Quarterly*, 38(1), 29–50.

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