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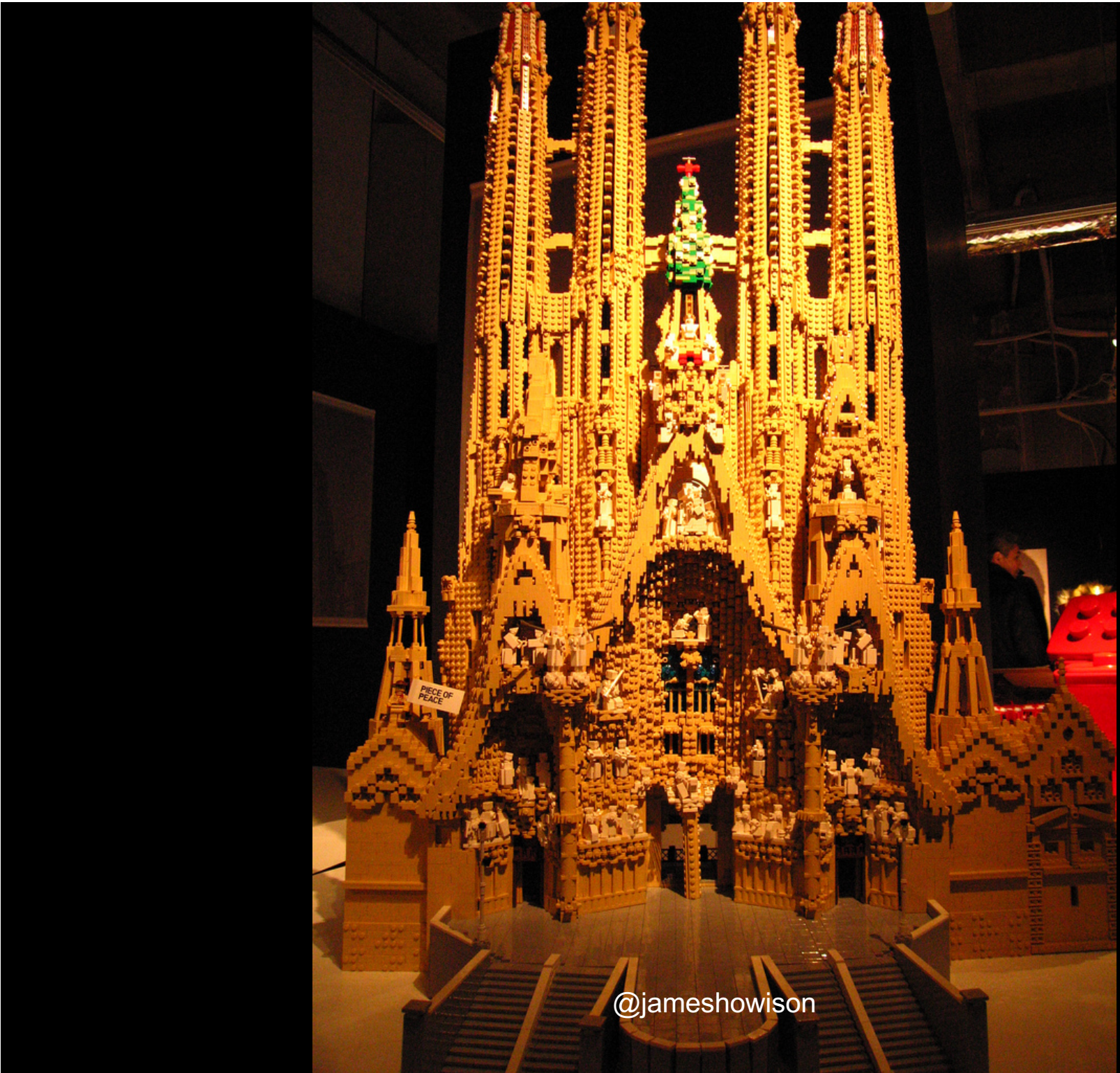
James Howison
(with Kevin Crowston)

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



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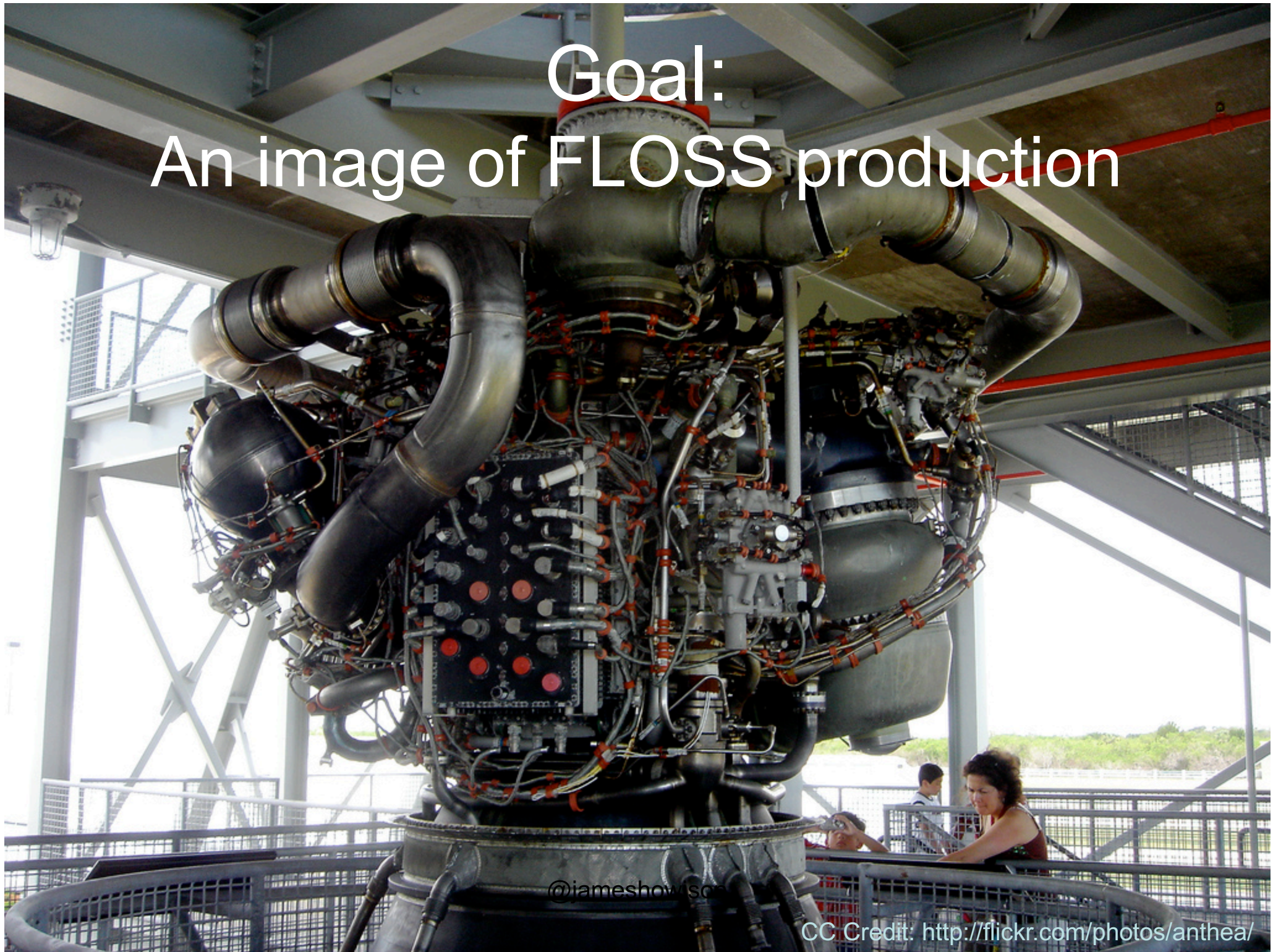


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A research arc

- 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

The screenshot shows a bibliographic software interface with a table of publications. The table has columns for Read, First Author, Year, Title, Container, and Added. Two entries by Karl E. Weick are highlighted in blue. Below the table, the details for these two articles are shown.

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 WoPDaSD (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 checked="" type="checkbox"/>	Weick, K. E.	1989	Theory construction as disciplined imagination	Academy of Management Review	2008-09-26
<input checked="" 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"/>	Brown, 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)

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Task: The Container Column

The screenshot shows a bibliographic software interface with a table of publications. The 'Container' column is highlighted in blue. The table has columns for 'Read', 'First Author', 'Year', 'Title', 'Container', and 'Added'. The 'Container' column contains journal and conference names. Below the table, two specific articles are shown with their full titles and journal information.

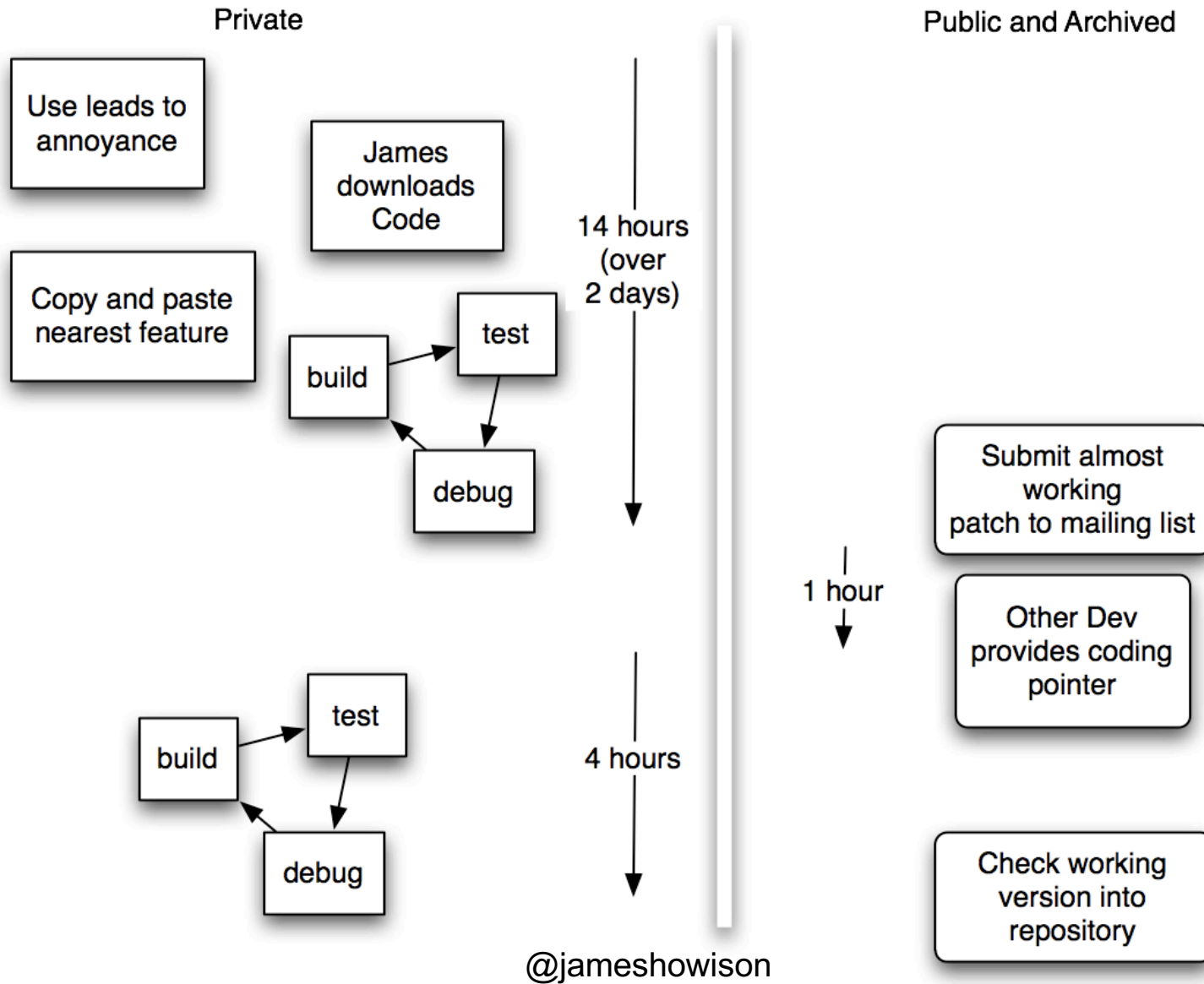
Read	First Author	Year	Title	Container	Added
<input type="checkbox"/>	Royer, Loïc	2008	Unraveling Protein Networks with Power Graph Analysis	PLoS Comput Biol	2008-08-12
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<input type="checkbox"/>	Weick, K. E.	1989	Theory construction as disciplined imagination	Academy of Management Review	2008-09-20
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<input type="checkbox"/>	Sutton, Robert I.	1995	What Theory is Not	Administrative Science Quarterly	2008-09-20
<input type="checkbox"/>	Glaser, B. G.	1978	Theoretical sensitivity: Advances in the methodology ...		2008-10-13
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How it was built



BibDesk 2.0?

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Task: “Web Groups”

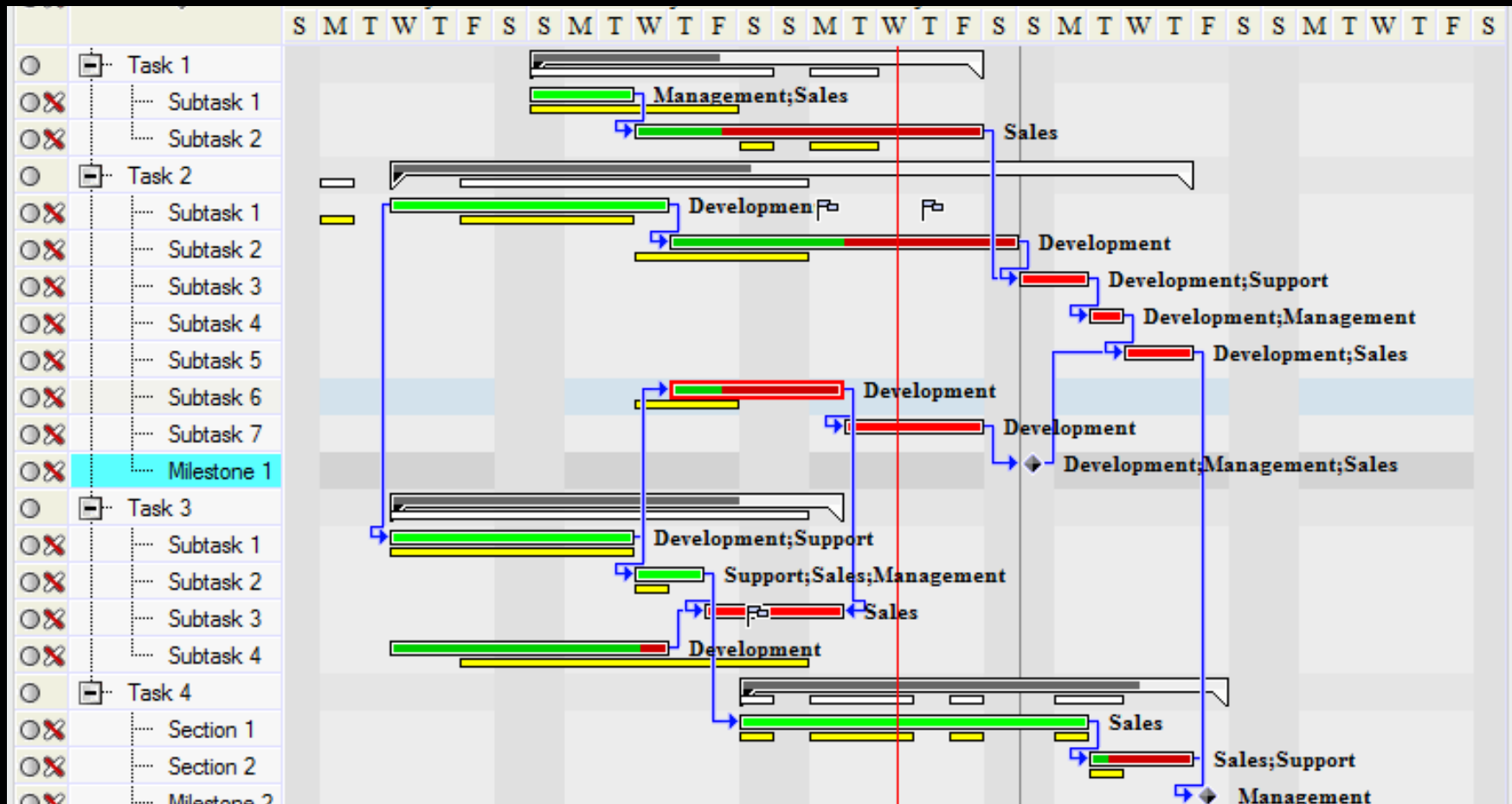
June 2003 (Email)

*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

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What didn't happen



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Image Credit:
TreeGrid.com marketing materials

Task: “Web Groups”

June 2003 (Email)

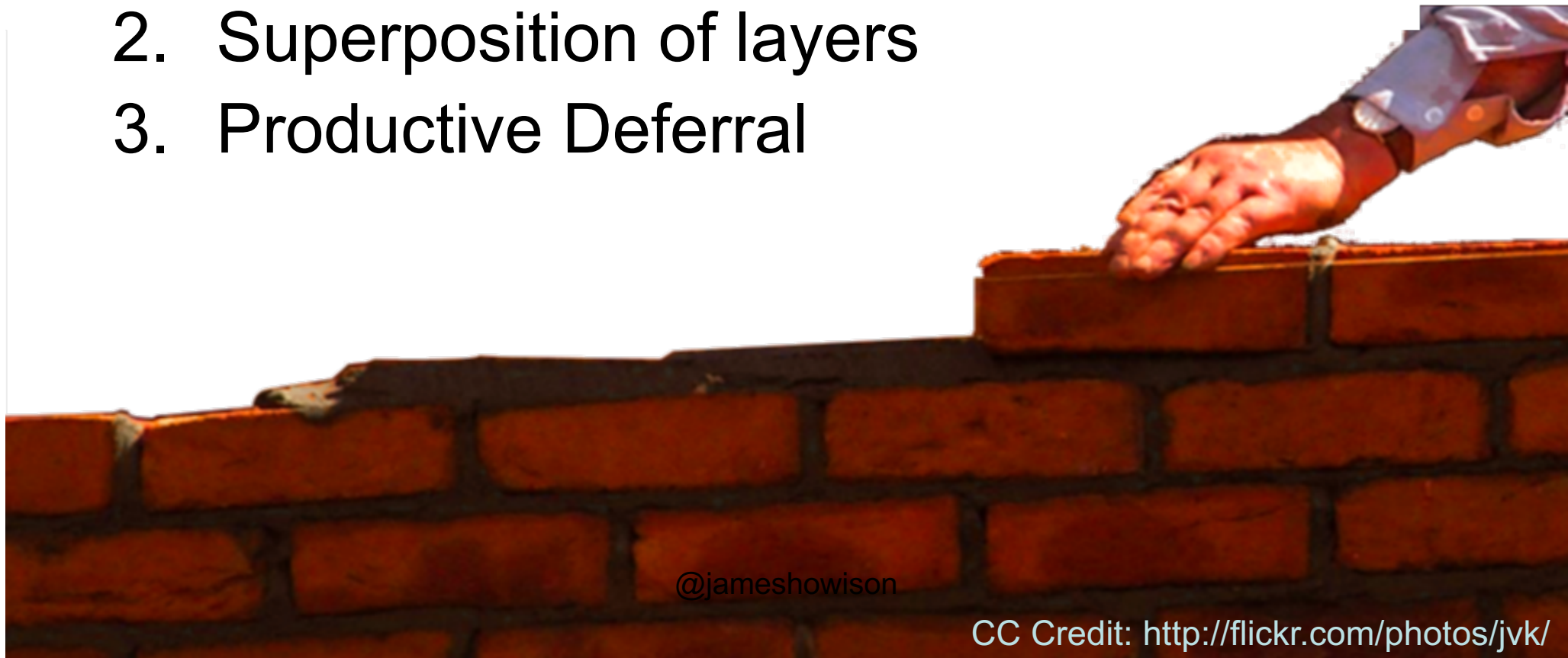
*I really want to use this, but **the conditions have never quite been right** - either I was waiting for ... RSS+RDF (now looks like it'll never happen) or ... an XML bibliographic file format ... (could happen now, but **I ran out of free time**).*

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?)*



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

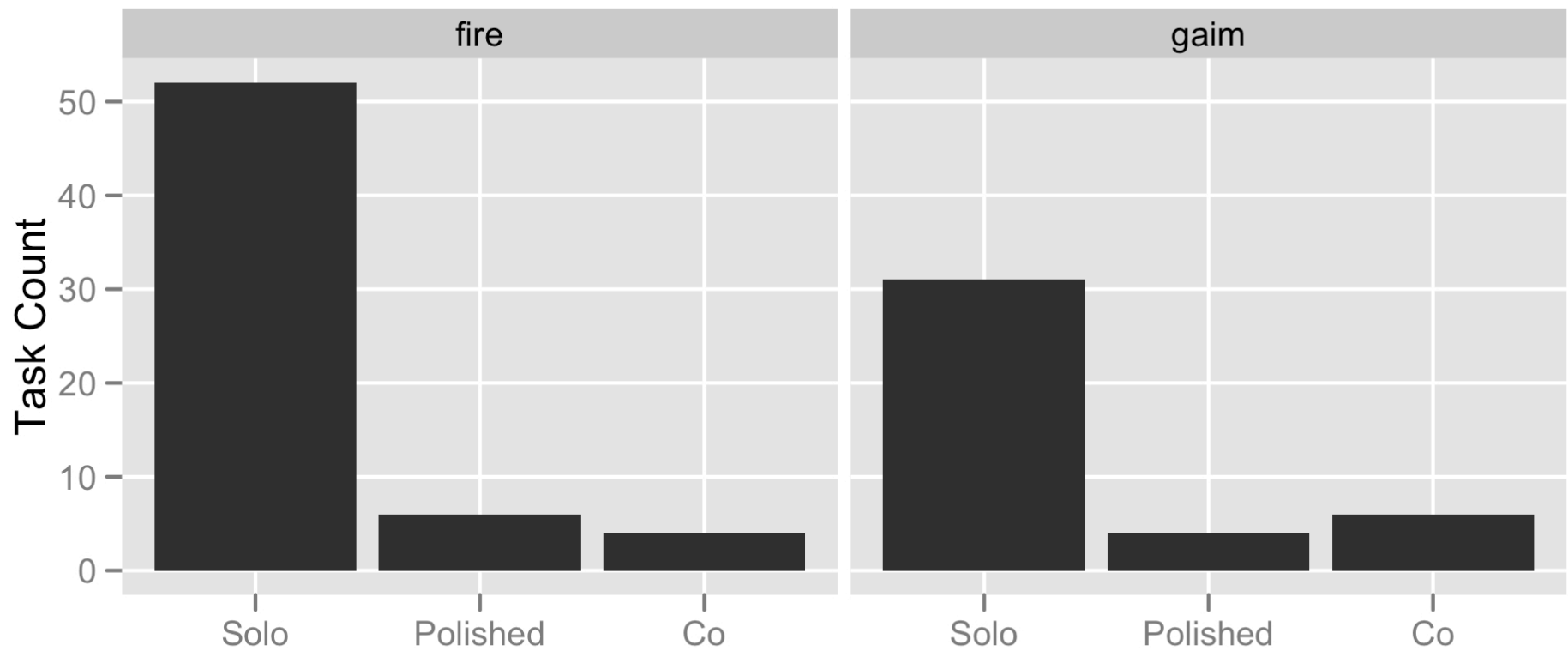
Illustrative Co-work

#	Date/Gap	Actor (overall role)	Action	Code Applied
Gaim Task 2: manual browser security fix				
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

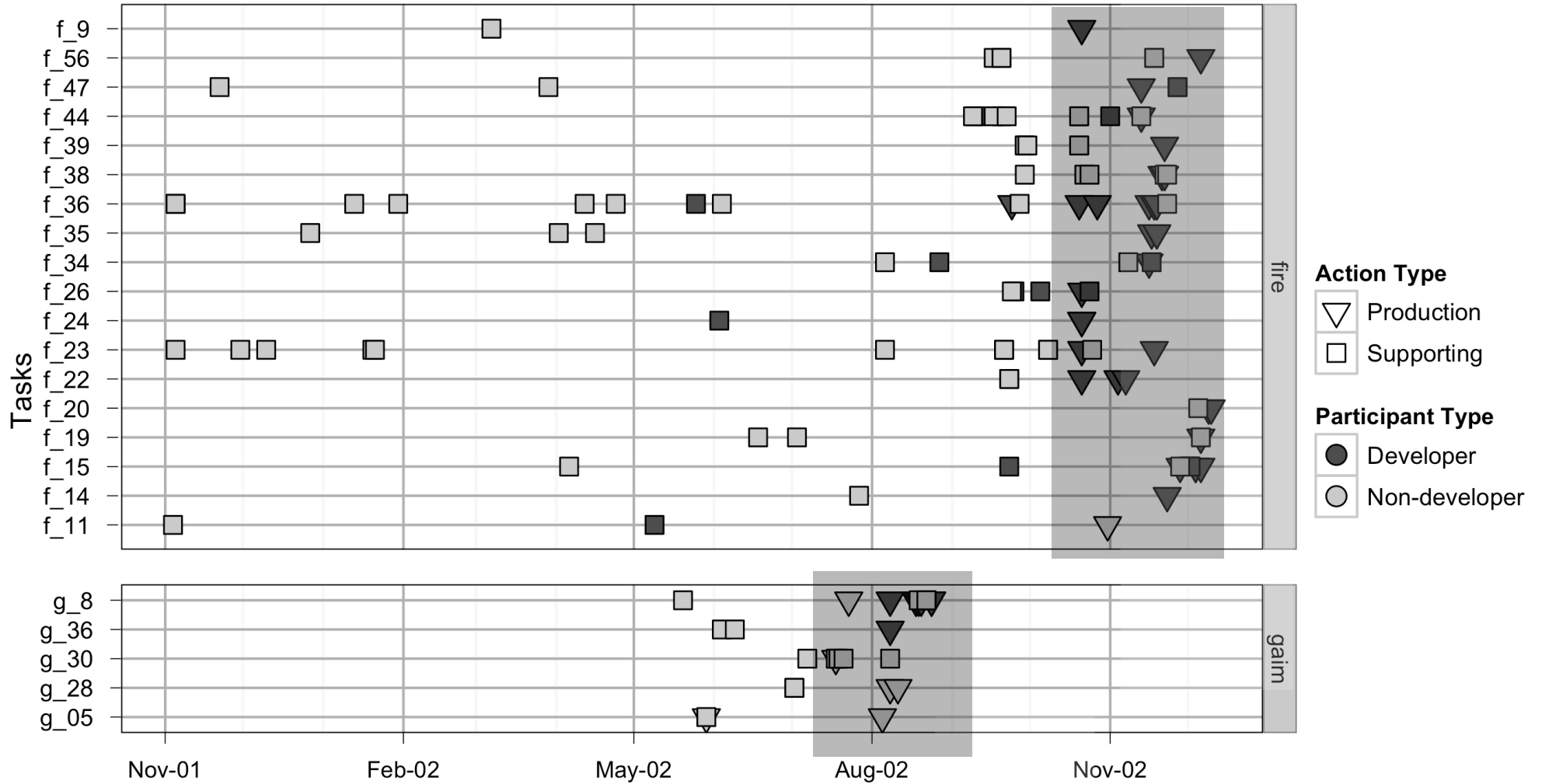
Illustrative Individual Work

#	Date/Gap	Actor (overall role)	Action	Code Applied
Fire Task 57: user list duplicate px				
1	Dec 06 2002	gbooker (dev)	fixes bug	Core Production
Gaim Task 3: iconv library integrated				
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
Fire Task 5: scroll on PgUp				
1	Nov 19 2002	nkocharh (p. dev)	makes PgUp scroll	Core Production
Fire Task 29: AIM buddy icons				
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
Gaim Task 18: Finnish Translation (Reviewed Solo)				
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



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

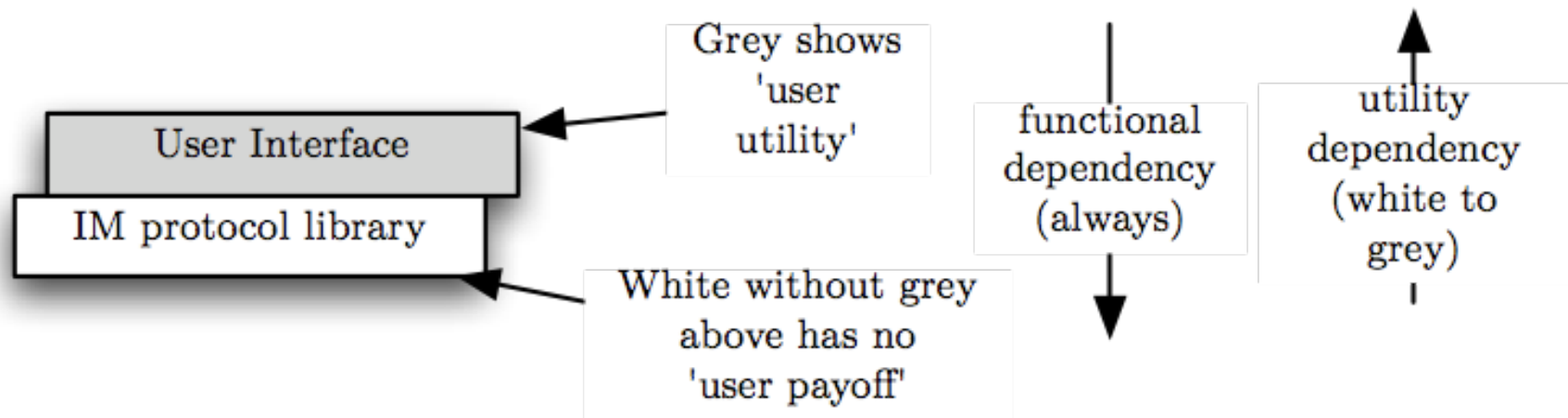
- Functional dependency:
 - Something else is needed for a product to work
- Motivational dependency:
 - Something else is needed for the work to be worthwhile (sufficiently motivating)

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)

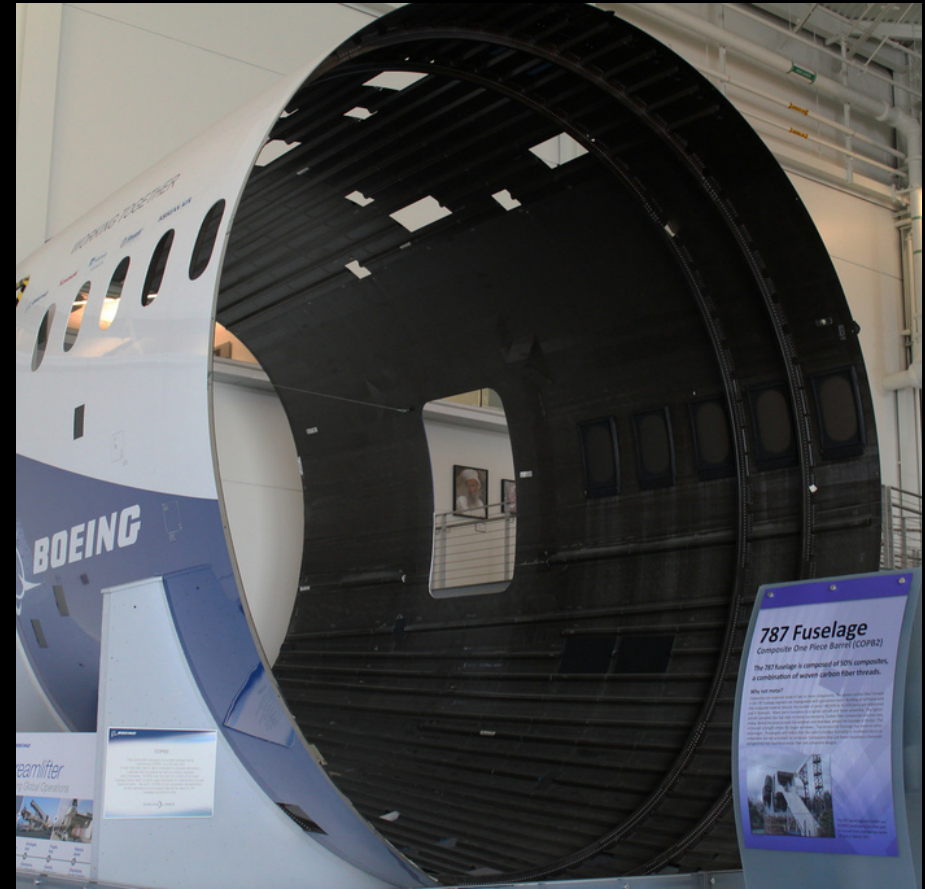
Contingencies for Open superposition

- 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

CC Credit:

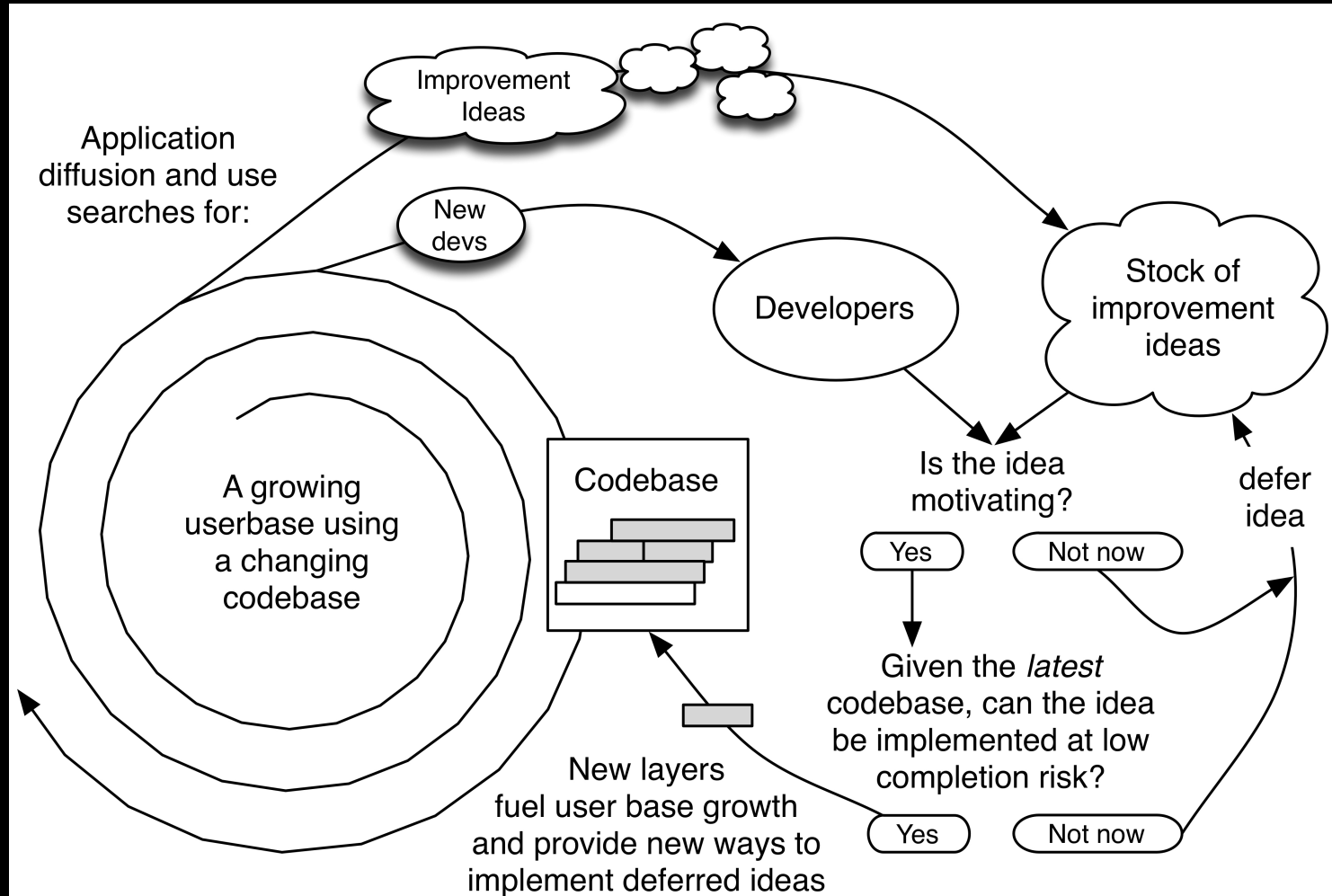
<http://www.flickr.com/photos/opacity/1600562651/>



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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