Open Source Software Communities

MIT Sloan School of Management
15.352

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THE BOSTON CONSULTING GROUP

AGENDA

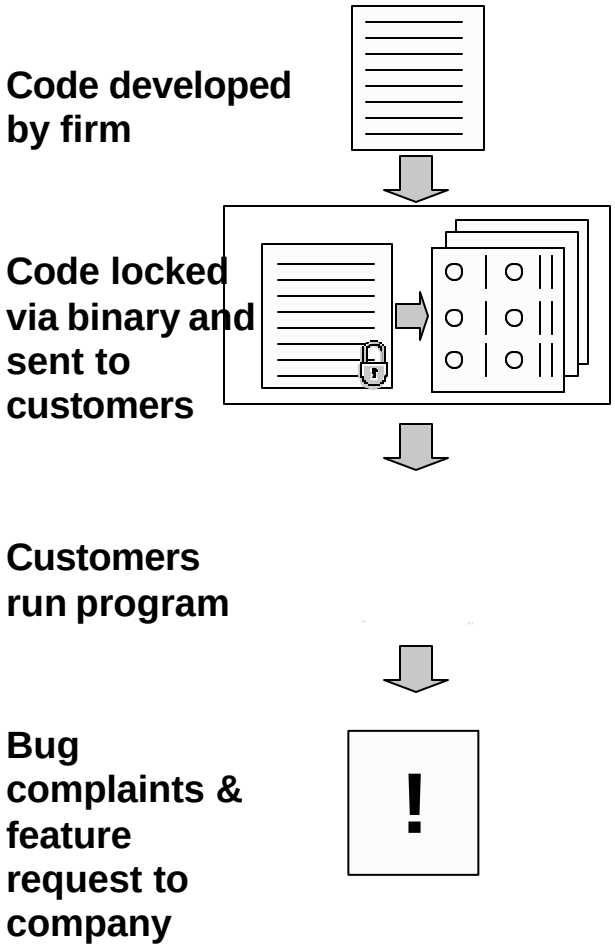
What is open source and why do people participate

- **How does open source work?**
- **What motivates developers?**

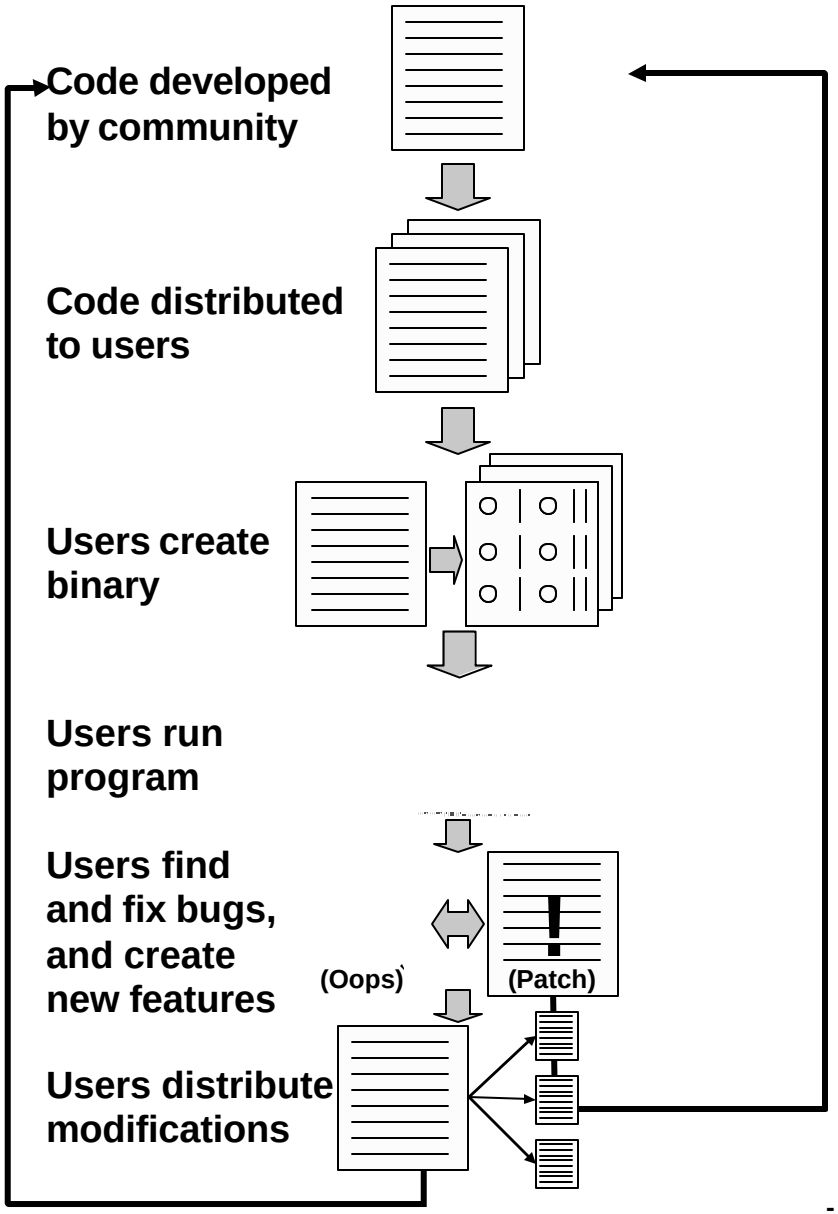
How does work get done?

WHAT IS OPEN SOURCE?

Firm-based software development

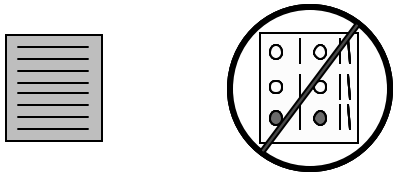


Open Source software development



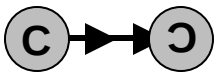
OPEN SOURCE PRINCIPLES

Intellectual property



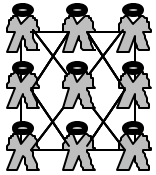
Code should always be open -
"Free speech, not free beer"

"Copyleft"

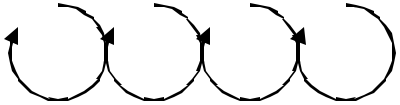


"Use copyright to
ensure copyleft"

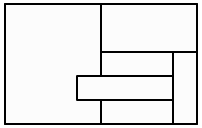
Development paradigm



Extensive involvement of
user/developer community



"Release early, release often"

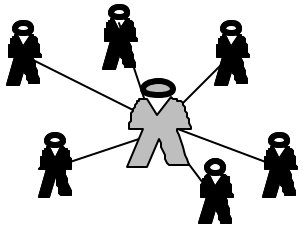


Modularize code

Resource model

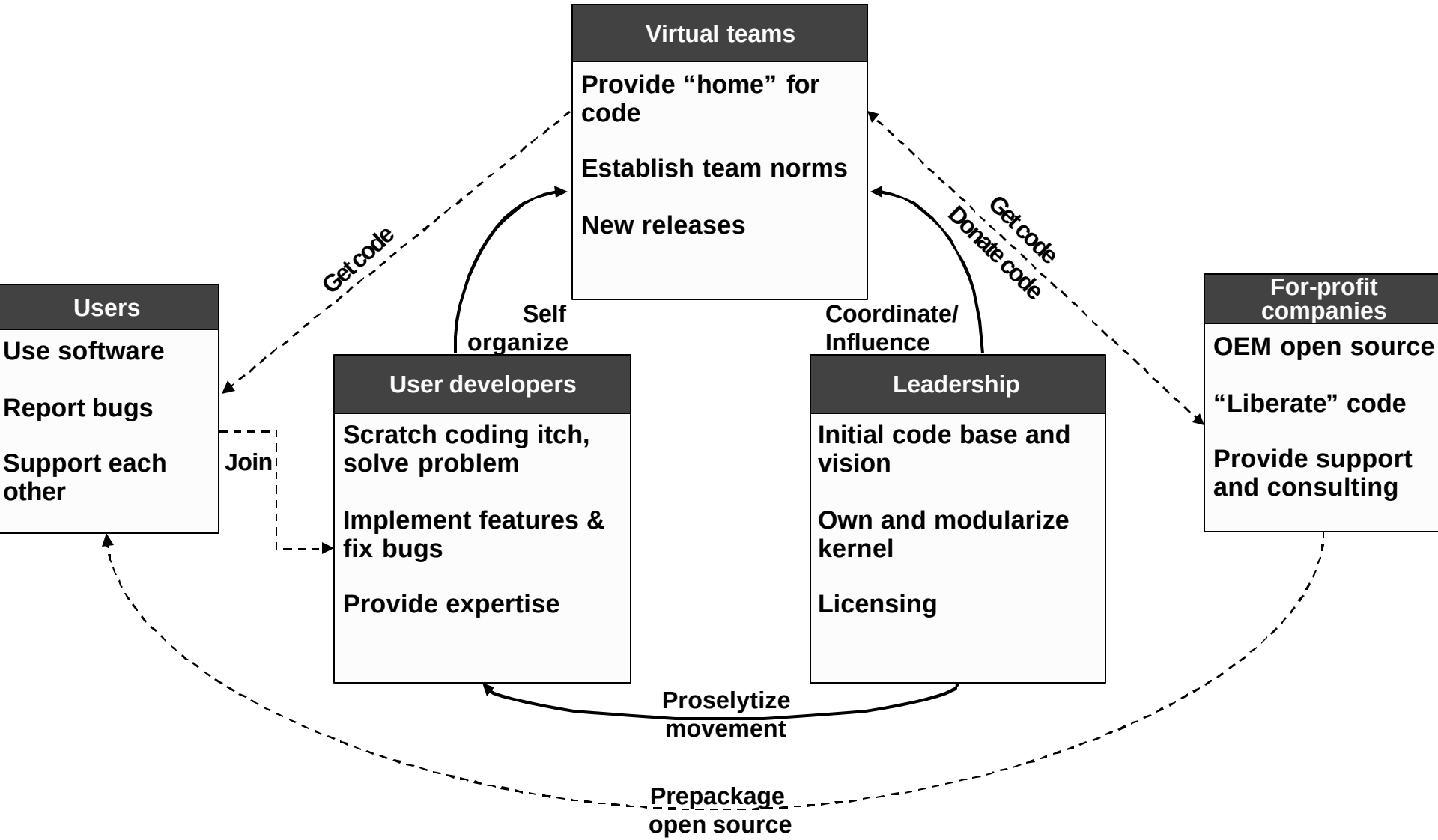
Good ideas come from solving
a problem or scratching an itch

"The three obligations: to give,
to receive, to reciprocate"



Peer leadership -
vision, engagement, code

HOW DOES OPEN SOURCE WORK?



LINUX DESIGN IS MORE EMERGENT THAN DIRECTED
Excerpts from Postings by Linus Torvalds

Rik van Riel:
“It seems like Linux really isn't going anywhere in particular and seems to make progress through sheer luck”

Linus (in several emails in a longer thread):
“Hey, that's not a bug, that's a FEATURE! [his emphasis]

“Do I direct some stuff? Yes. But, quite frankly, so do many others. Alan, Al, David, even you. And a lot of companies are part of the evolution whether they realize it or not. And all the users end up being part of the ‘fitness testing’....

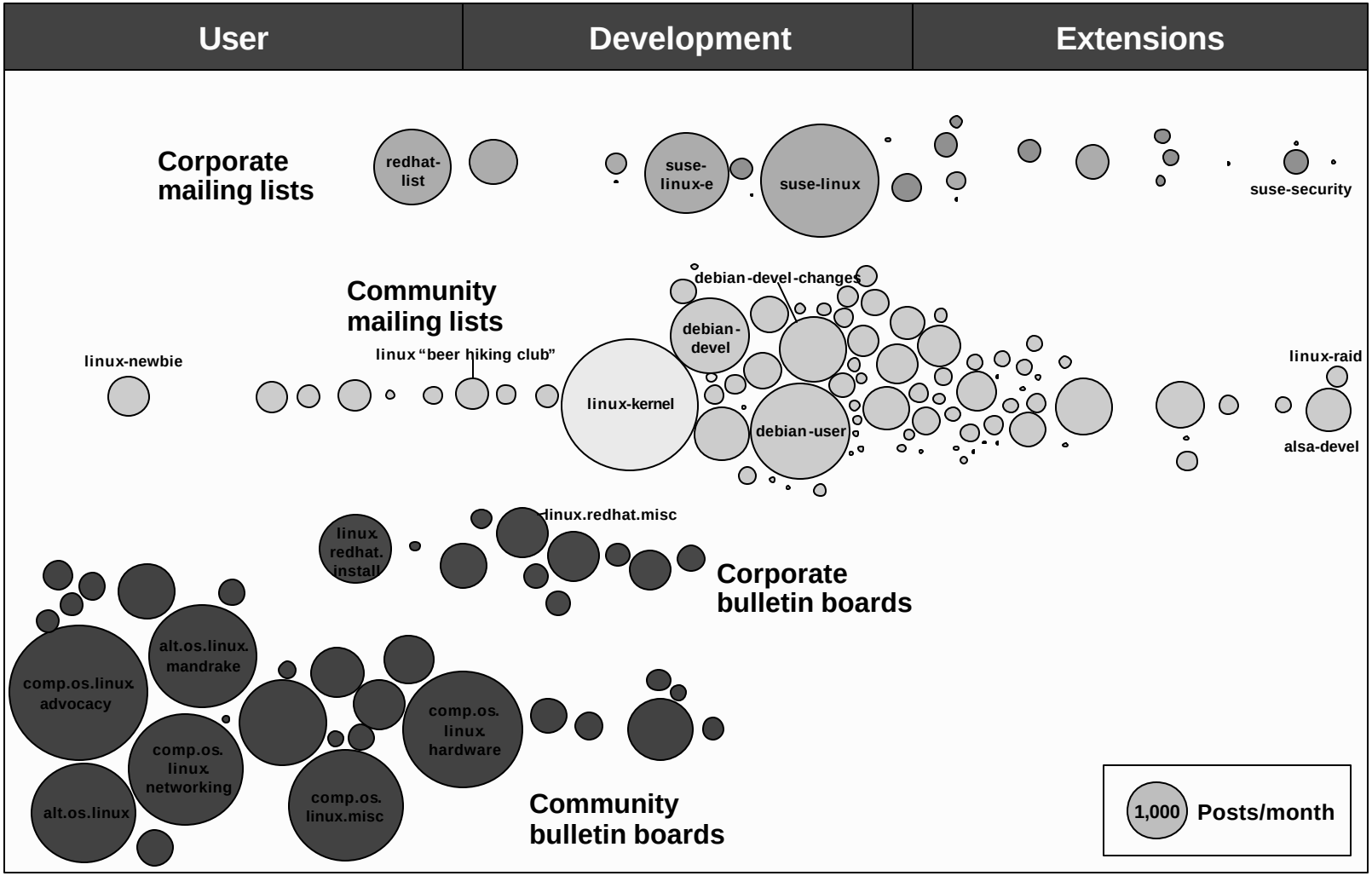
“A strong vision and a sure hand sound good on paper. It's just that I have never met a technical person (including me) whom I would trust to know what is really the right thing to do in the long run....

“Too strong a strong vision can kill you -- you'll walk right over the edge firm in the knowledge of the path in front of you...

“I'd much rather have ‘brownian motion,’ where a lot of microscopic directed improvements end up pushing the system slowly in a direction that none of the individual developers really had the vision to see on their own.”

Source: Linux kernel email list

MORE THAN 85,000 MESSAGES A MONTH COORDINATE THE LINUX ENTERPRISE



Note: Number of messages posted in June 2000 on 147 relevant bulletin boards and mailing lists (duplicate postings removed)
Source: deja.com; geocrawlers.com; BCG analysis

CRITICAL TO UNDERSTAND MOTIVATIONS AND ORGANIZATIONAL STRUCTURE OF OPEN SOURCE

Motivations

- **Are developers working for "free"?**
- **Why are they participating?**
- **What kind of effort are they contributing?**

Organizational Structure:

- **How are projects organized?**
- **What kind of structure enables dispersed, virtual collaboration?**
- **What are the lessons for firms?**

Is the open source movement a fad or is it sustainable?

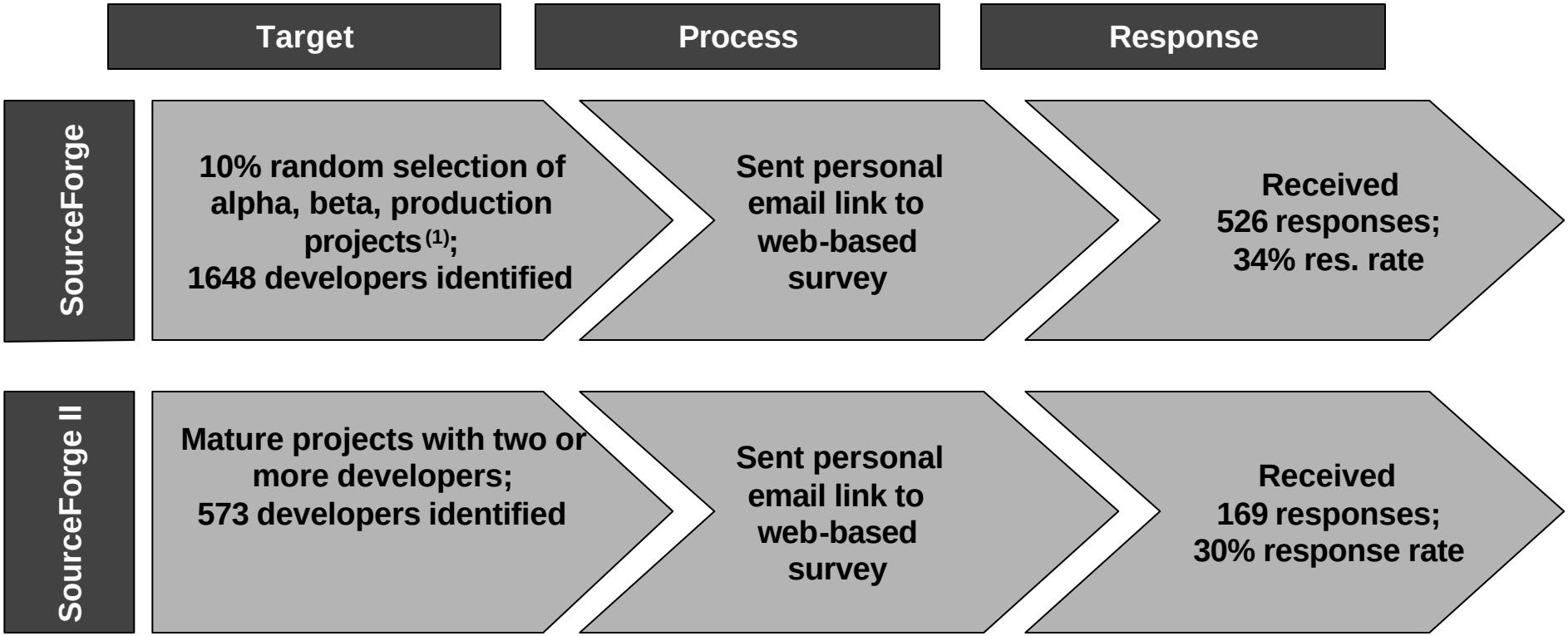
AGENDA

What is open source and why do people participate

- **How does open source work?**
- **What motivates developers?**

How does work get done?

SURVEY OF PROJECTS ON SOURCEFORGE.NET TO UNDERSTAND MOTIVATIONS IN COMMUNITY



Results based on 684 usable responses

(1) Projects had 50% or greater activity level

OVERVIEW OF KEY FINDINGS ON HACKER MOTIVATIONS

Why should we care?

High creativity

What motivates hackers?

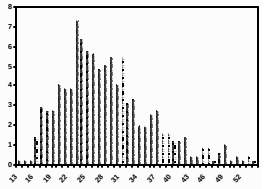
?

Fun, skill, freedom and need

Increasing knowledge biggest benefit

Losing sleep biggest cost

Who are these guys?

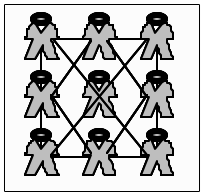


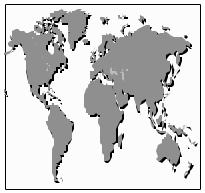
Volunteer significant time

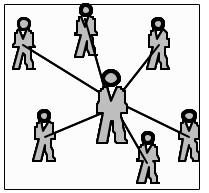
IT professionals

Generation Xers

What about the community?







Strong identification

Global effort

Peer leadership preferred

OSS PROJECTS AND PROGRAMMING TURNS ON HACKERS

61.7% **“This project is as (or most) creative as anything I have done”**

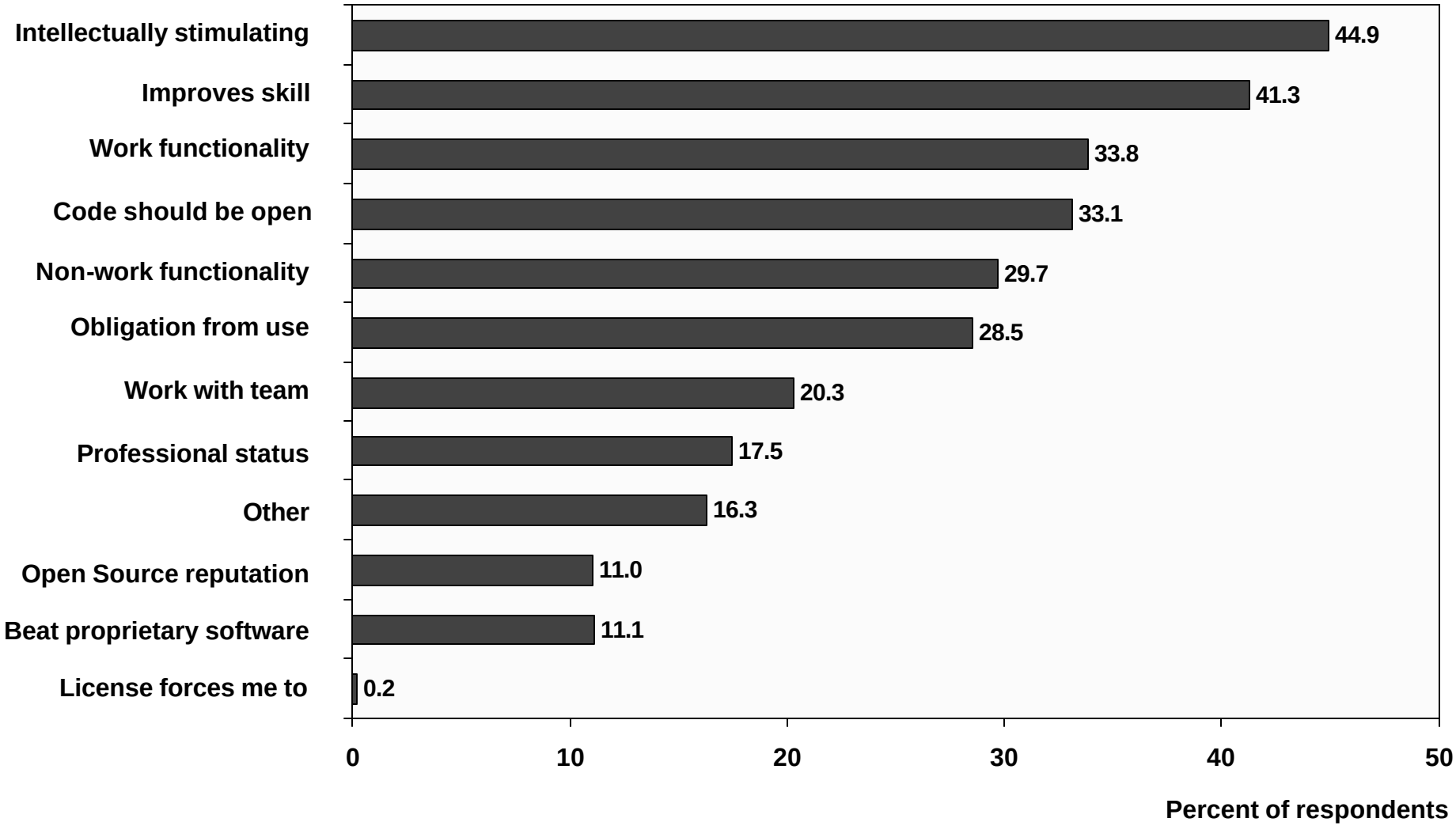
48.4% **“Like composing poetry or music”**

72.6% **“When I program, I lose track of time”**

60.0% **“With one more hour in the day, I would spend it programming”**

Note: “...like composing poetry...” answer chosen as one of top three attitudes by participants; other answers based on degree of participant agreement with statement

OVERALL HACKER MOTIVATIONS



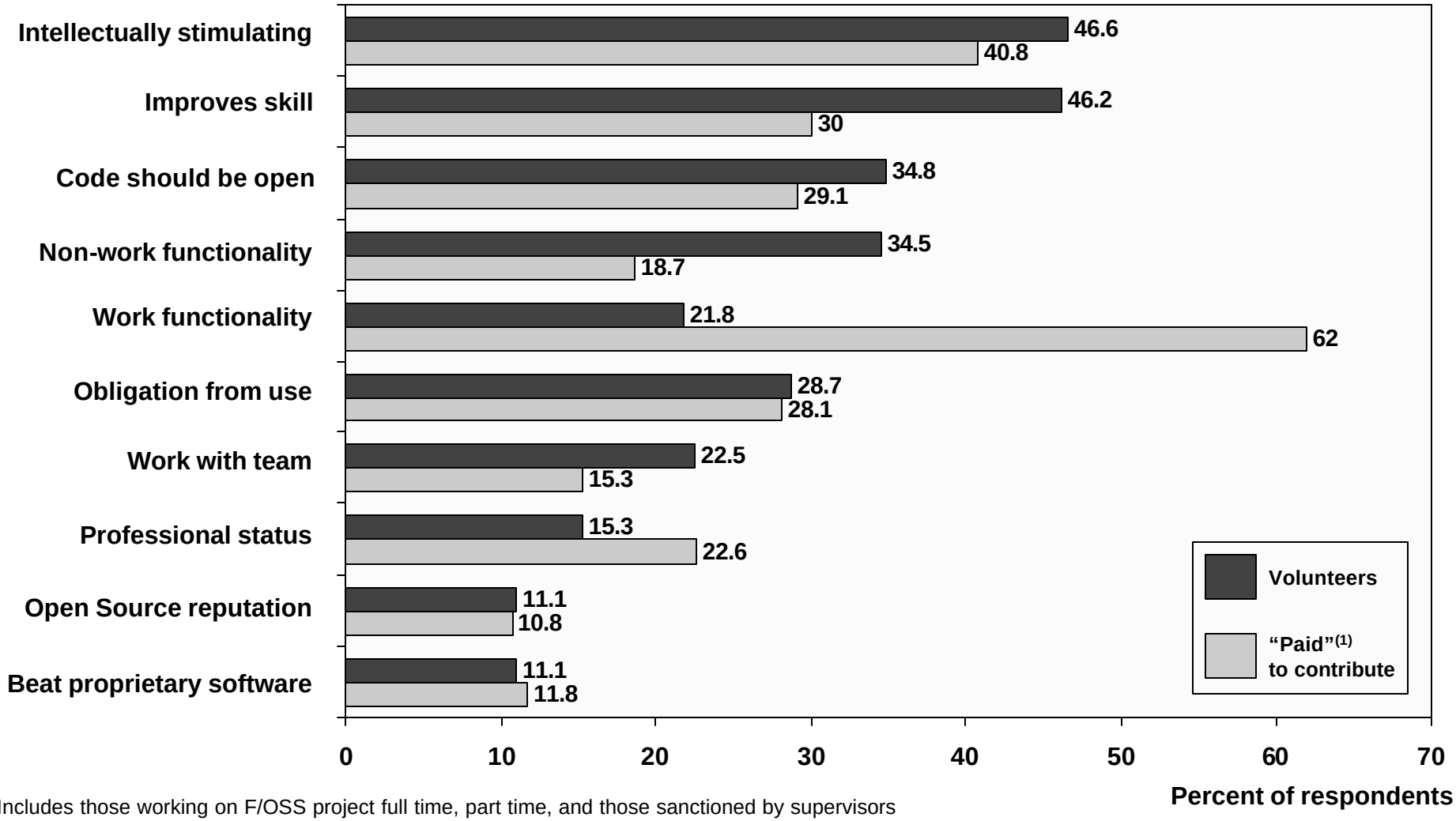
Note: Question asked for top three motivators of F/OSS participation, n=684

VOLUNTEER CONTRIBUTORS MAKE UP MAJORITY OF RESPONDENTS

	Volunteer	Paid
Percent of responses	60	40
Selection criteria		
"Have you been financially compensated in any way for participating in this project?"	No	Yes
"Is your direct supervisor aware of your project participation (during work time)?"	No	Yes

?

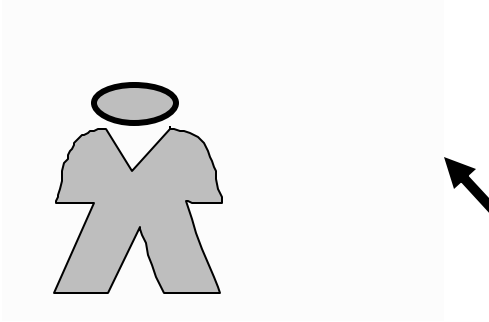
MOTIVATIONS DIFFER BETWEEN PAID AND VOLUNTEER CONTRIBUTORS



(1) Includes those working on F/OSS project full time, part time, and those sanctioned by supervisors
(2) Volunteers= 479, paid=205
Note: Question asked for top three motivators of F/OSS participation, n=684

MOTIVATIONS AND CONTRIBUTION STATUS SEGMENT HACKERS

"Community Believers" (19%)



Do it because they feel obligation and believe source code should be open

"Professionals" (25%)

Do it for work need

Motivations

?

"Hobbyists" (27%)

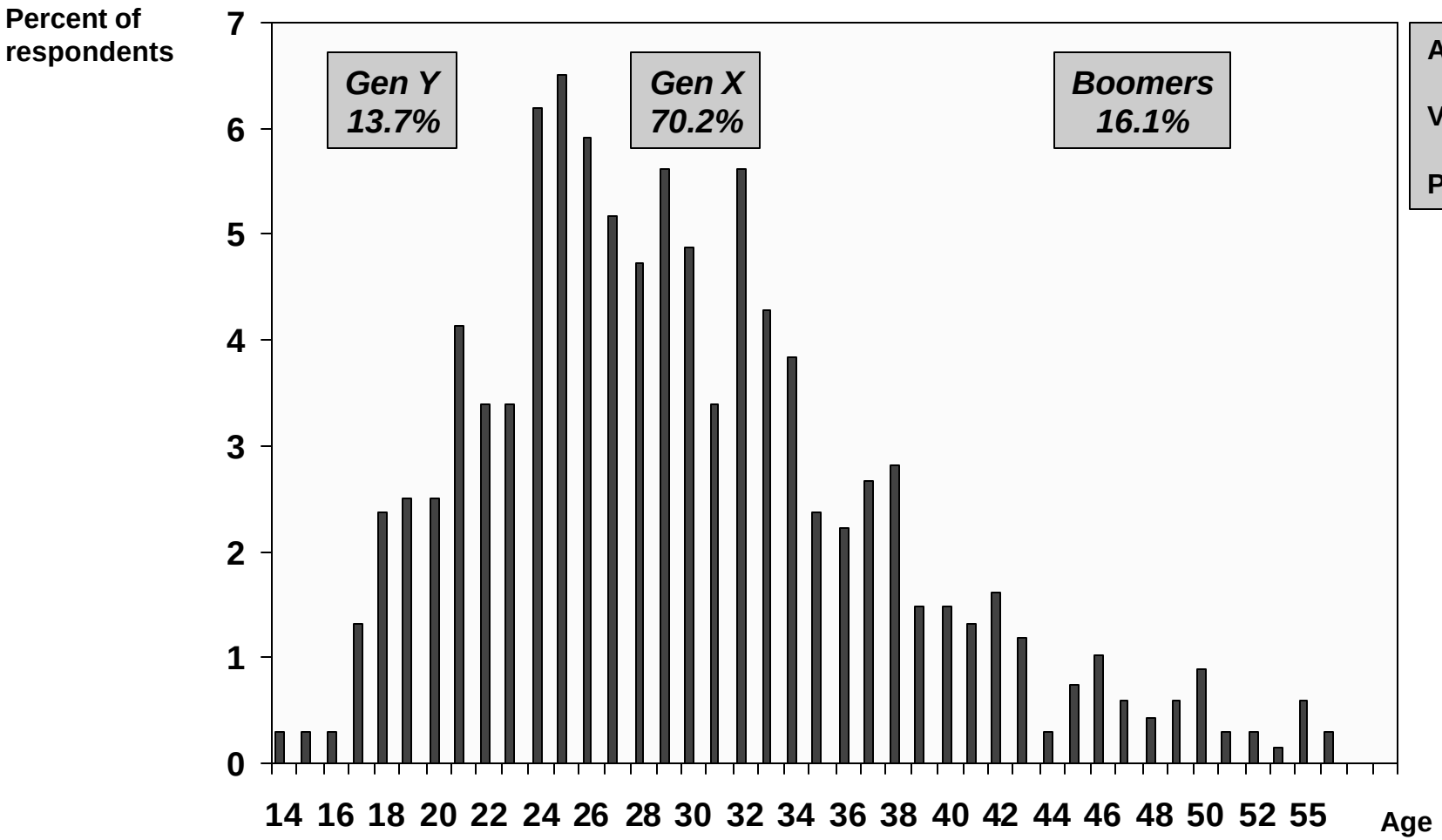
Do it for non-work

"Learning & Stimulation" (29%)

Do it for skill improvement and fun

OPEN SOURCE IS A GENERATION "X" PHENOMENON

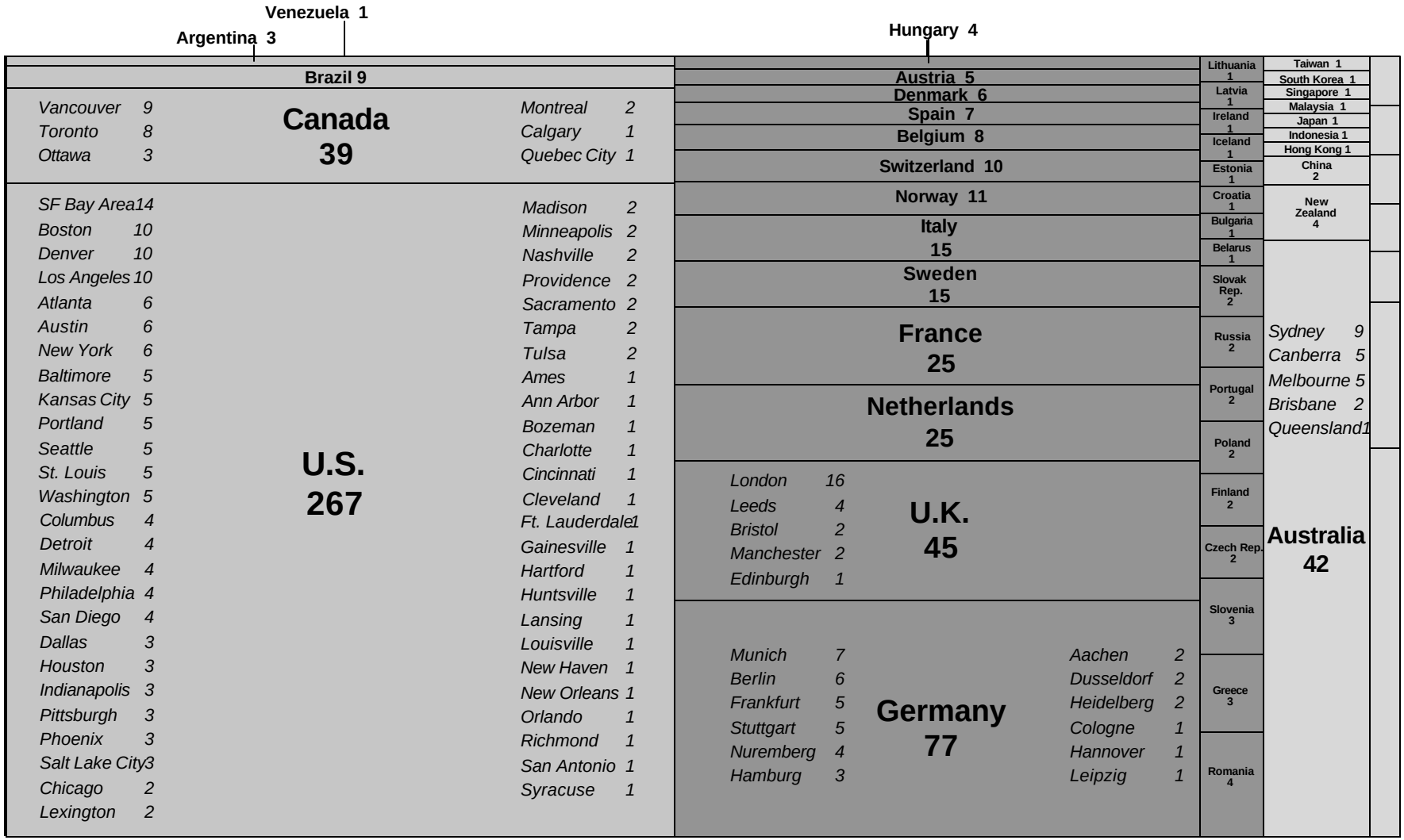
Average Age: 30 Years



And 98% male

Note: n = 677 total responses

OPEN SOURCE IS A GLOBAL ENTERPRISE

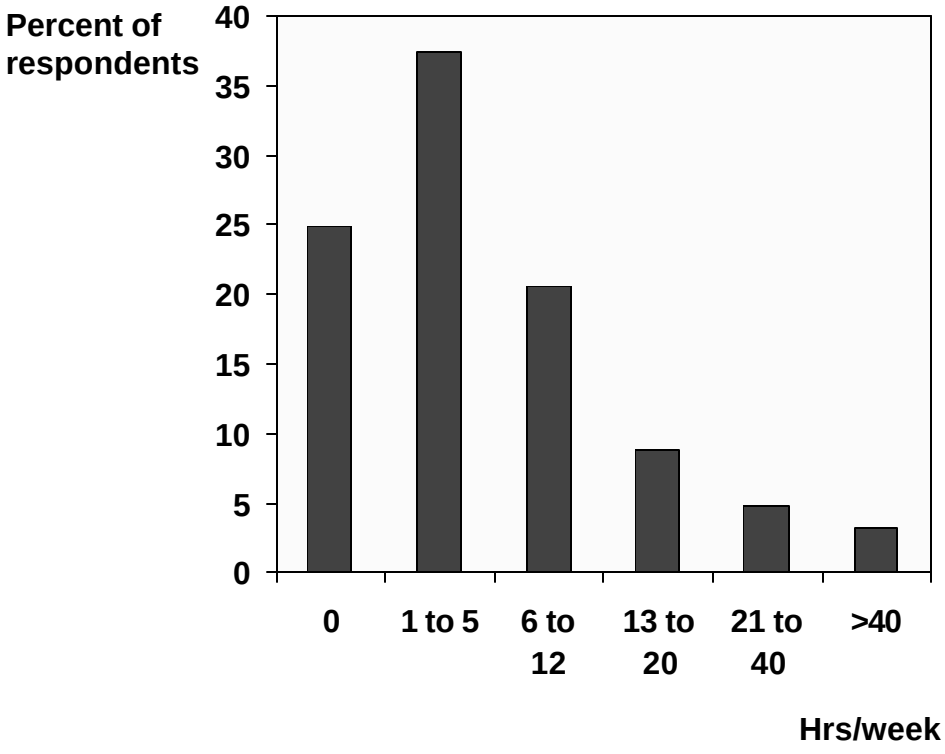


Note: n = 684 total responses, ROW = Rest of the World

RESPONDENTS VOLUNTEER A LOT OF TIME

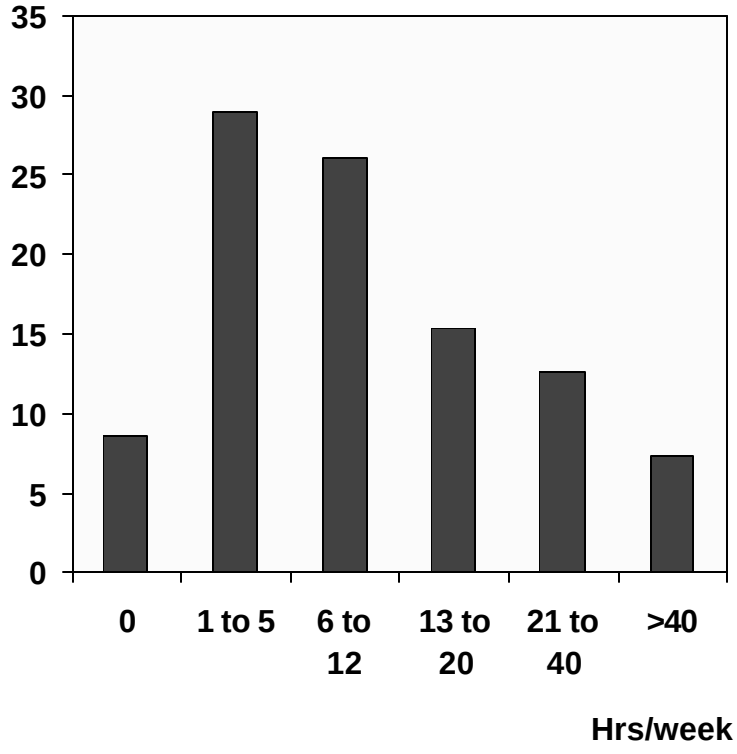
"This" project

Overall mean=7.5 hours/ week
Volunteers=5.8 hours paid= 11.4 hours



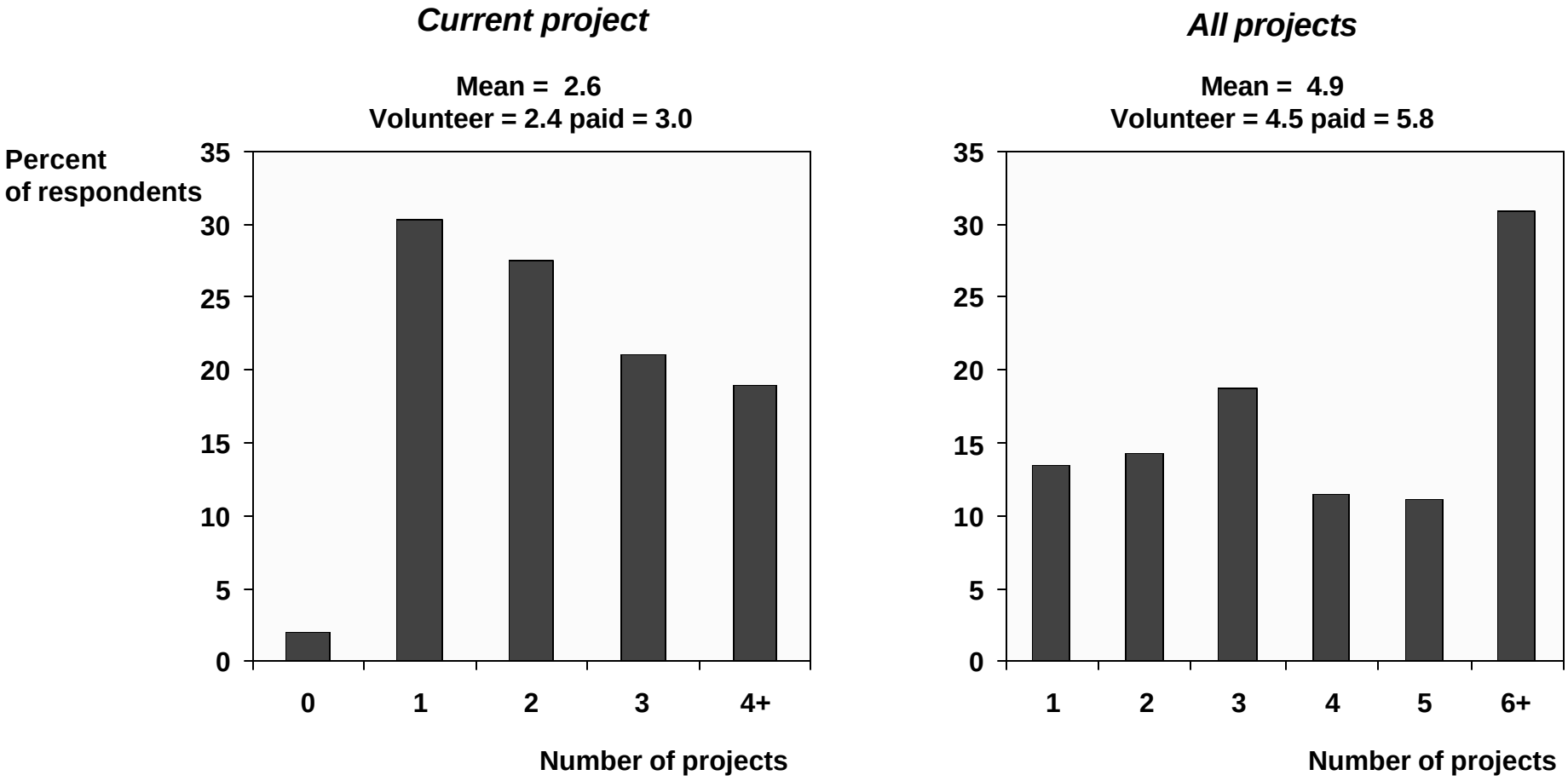
All projects

Overall mean= 14.09 hours/ week
Volunteers=13.5 hours paid= 20.9 hours



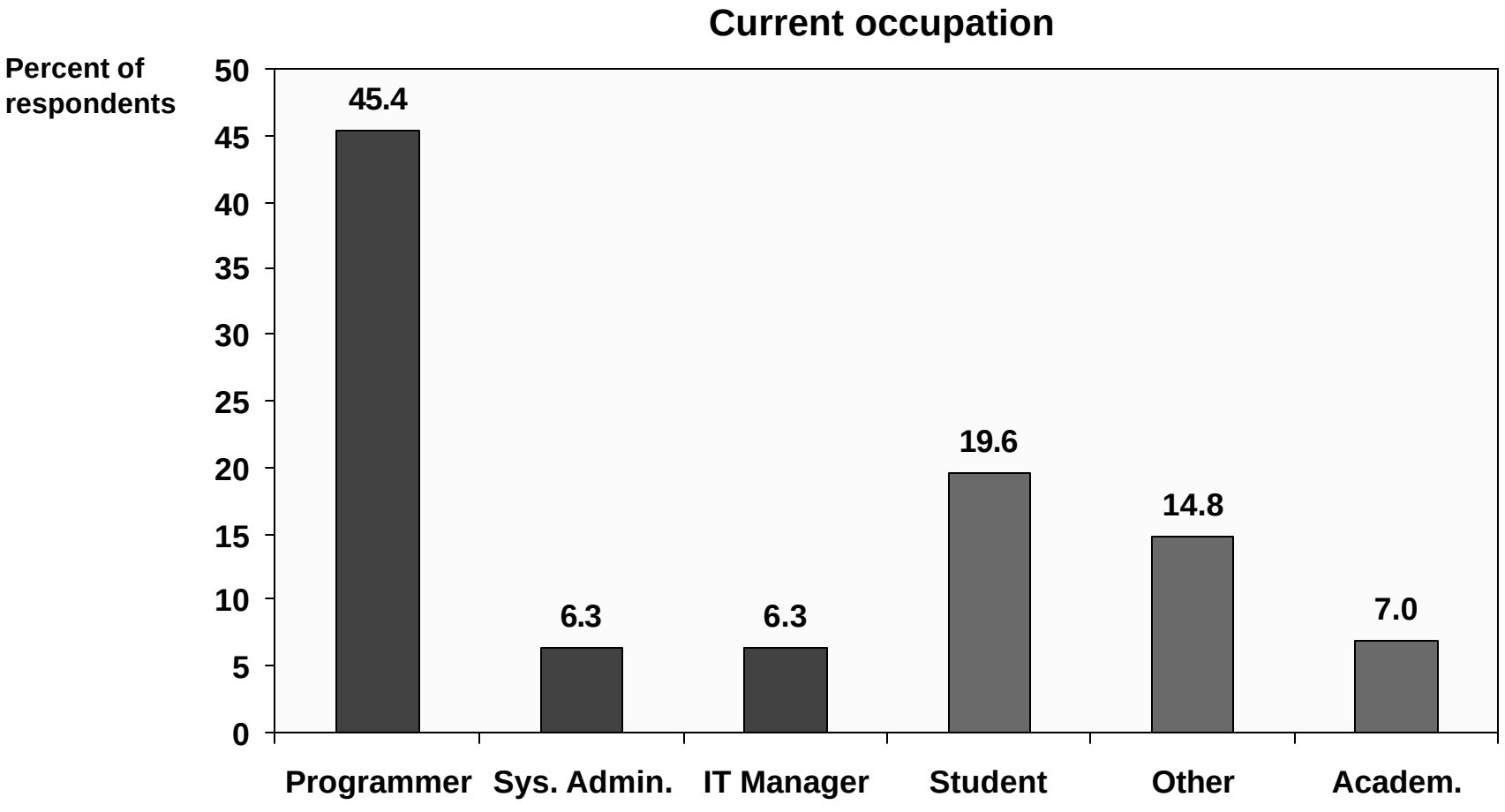
Note: n=684

CONTRIBUTE TO MANY PROJECTS



Note: N = 684

PARTICIPANTS ARE MOSTLY EXPERIENCED IT PROFESSIONALS



Average 11 years of programming experience

Note: n=678

PROJECT CREATIVITY LARGEST DRIVER OF EFFORT

Regression on Project Hours/ Week

What is significant?
+ Creativity on project
+ Professional status(1)
- IT training(1)

What is not?
Age
IT Job
Hacker affiliation
Founder of project
Prior social connection
USA based
Work functionality
Non-work functionality
Intellectually stimulating
Improves skill
Work with team
Code should be open
Beat proprietary software
Community reputation
Obligation from use

(1) Volunteers only

HIGH PROJECT CREATIVITY DRIVES HOURS CONTRIBUTED

	Volunteer	Paid
Average hours/ week contributed	5.8	11.4
Impact of unit change in creativity (scale: 1- much less, 2-somewhat less, 3-equally, 4-most creative)	3.3	6.3
Anticipated hours with one unit increase in creativity	9.1	17.7
Percent increase in hours	57%	55%

SUMMARY OF COMMUNITY MOTIVATIONS

No single motivation driving community participation

- **Community is a "Big Tent" – participants can contribute for any reason**
- **Professional needs, community motivation, fun and learning and hobby are the primary types of motivations for participation**

Negativity towards commercial software developers not a prime mover

Feeling creative biggest predictor of incremental effort on projects

AGENDA

What is open source and why do people participate

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OPEN SOURCE COMMUNITIES FACE UNIQUE CHALLENGES

“Voluntary” participation

Dispersed contributors

Part-time and intermittent participation

Lean communication & collaboration technology

Rudimentary management tools

“Missing” project managers

So How Do They Get Work Done?

Research Questions For My Dissertation

What are the specific practices for distributed development used by Open Source communities?

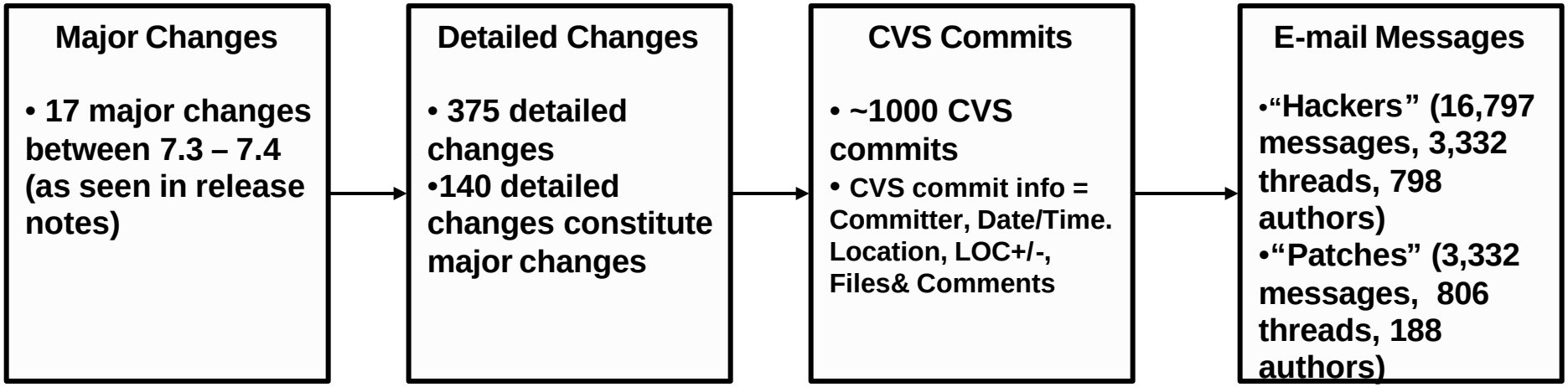
How do these practices work and how are they inter-related?

How similar and different are the practices used by Open Source projects to firm-based development?

Dissertation Analyzes Practices From Two Cases

Characteristics	PostgreSQL	Cocoon
Technical		
• Area	Database	XML web dev. environment
• Rate of change in technology	Stable – mature technology	Fast changing & new
• Lines of code	~500, 000 LOC	~1,000,000 LOC
• End-users	Database administrators	Web developers
• Competition	Oracle, IBM, Microsoft, MySQL	???
"Organization"		
• Origins	UC Berkeley academic project	User need from Apache project
• Time active	(1984-1996)1996	2000
• Steering committee size	5	32
• Commit access	12	60
• Development list size	3,039	1689
• Affiliation	None	Apache Software Foundation

Grounding The Model In Actual Data: Building A Process History Of Each New Feature In PostgreSQL (7.3 -7.4, November 2002-2003)



Follow-up with E-mail, telephone, IRC and face-to-face interviews

Study Design And Data

Inductive grounded theory building of Open Source development process

- **Virtual ethnography of two communities (PostgreSQL & Apache Cocoon) – 8 months**
- **Extensive interviewing of project participants**
- **Analysis of e-mail and source code change archives**
- **Analyzing one year's worth of complete technical activity (~15,000 e-mails and ~2000 source code changes) for each project to build innovation history of each new feature**
- ***Have developed a preliminary model of development practices***

User/Developer(s) Creates New Feature

Mario Weilguni (user/developer) outlines a problem that he faces with database vacuuming (Sept 3, 2002)

9 other individuals participate in the discussion about this need and possible solutions – general agreement that it would be good to do – Tom Lane (steering committee) makes several technical suggestions (Sept 3, 2002)

Shridhar Dahitankar (new user/developer) announces that he is going to work on this but needs some information (Sept 3, 2002)

Matthew O'Connor (new user/developer) also announces that he is going to work on the same topic (Sept 3, 2002)

Shridhar Dahitankar – announces that the code is ready based on prior discussion (Sept 23, 2002)

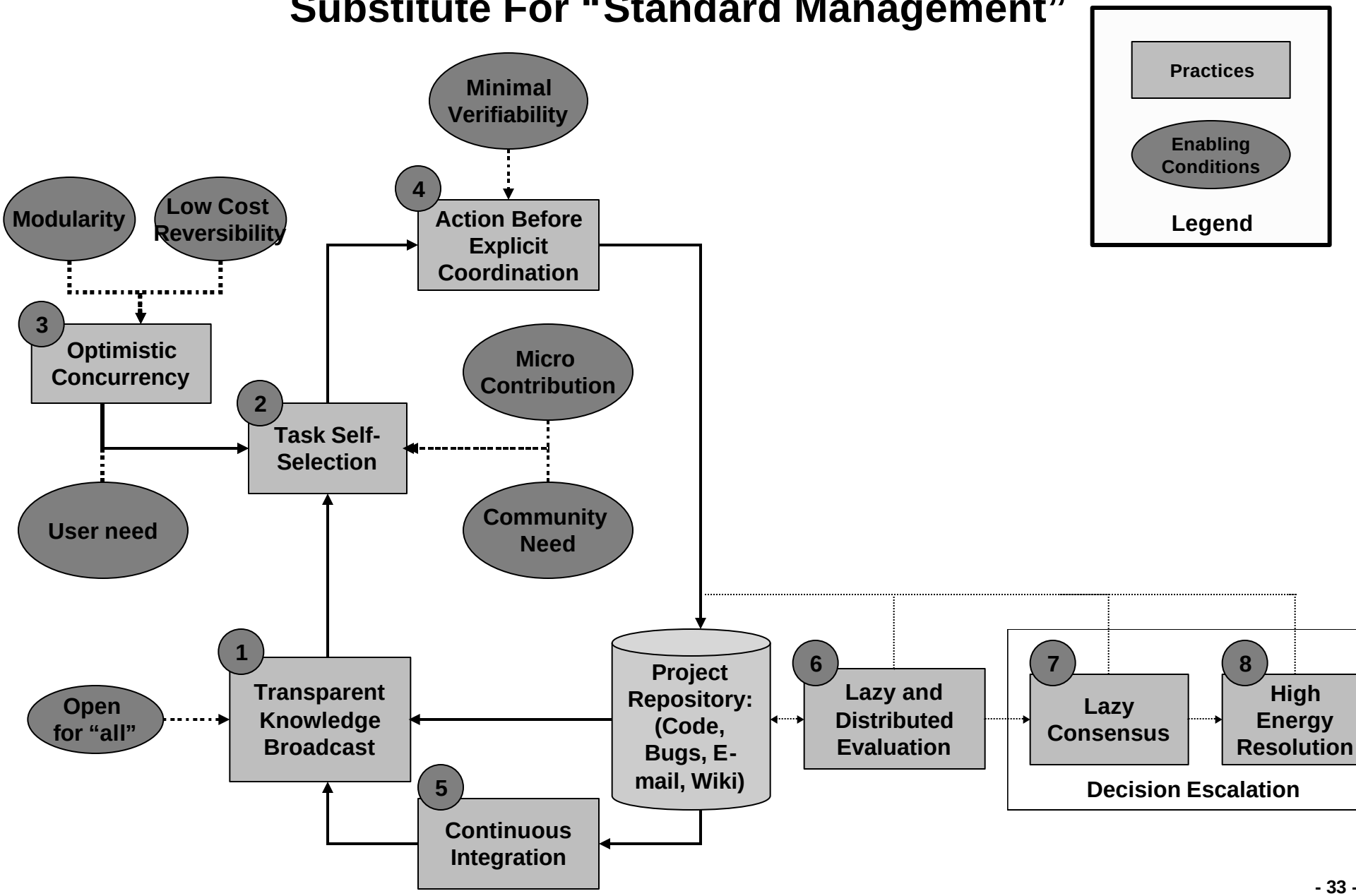
Other people give feedback and Mario reveals an attempt at the same feature (Sept 24, 2002)

Matthew O'Connor asks some coding questions (September 24, 2002)

Matthew O'Connor announces a "new & improved" version of the Shridhar's code (November 26, 2002)

Shridar Dahitankar asks questions and makes suggestions (November 27-28, 2002)

Preliminary Inductive Model Of Open Source Practices That Substitute For "Standard Management"



Many Thanks To:

Eric von Hippel

Wanda Orlikowski

Leslie Perlow

Carliss Baldwin

Georg von Krogh

Stefano Mazzocchi

Ben Hyde

Brian Behlendorf

Neil Conway

Luis Villa

Bruce Momijian

Guido van Rossum

Anthony Baxter

LMU-MIT User Innovation Workshop

MIT Sloan Doctoral Seminar in Strategy

+ numerous participants in Python, PostgreSQL, Apache, and Freenet projects