

Beyond the Code Itself: How Programmers *Really* Look at Pull Requests

Denae Ford, Mahnaz Behroozi, Alexander Serebrenik, Chris Parnin {dford3, mbehroo, cjparnin} @ncsu.edu, a.serebrenik@tue.nl North Carolina State University + Eindhoven University of Technology NL

HOW ARE PULL REQUEST REVIEWED?

Pull requests can get rejected for reasons such as infrequent contributions or irrelevant projects

@DenaeFordRobin



56 contributions in the last year



BUILDING ON PRIOR WORK

E		211	IТ	'C
	٦C;	3U		J

	Participants																			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Experience	Н	Η	Н	L	Н	Н	Н	Н	Н	Н	L	L	Н	L	Н	L	L	L	Н	L
PR Reviewed	P e	P e	P©	A e	A©	A©	A©	Τ©	Τ©	Τ©	P e	Pe	P©	A e	A e	A©	A©	T e	T e	T©
Decision Evaluation	T✓	_	F✓	_	Т <mark>×</mark>	F✓	Т <mark>×</mark>	T×	_	T×	T✓	T✓	F✓	F×	T✓	F✓	T x	T✓	T✓	T×
Overview																				
Code Signals																				
	67%	66%	66%	21%	59%	25%	70%	83%	27%	73%	60%	70%	25%	69%	52%	75%	86%	63%	58%	27%
Technical Signals																	•			
Social Signals	26%	30%	28%	48%	29%	49%	22%	11%	57%	17%	31%	24%	62%	25%	42%	18%	7%	28%	38%	56%
Social Signals	7%	4%	6 %	31%	12%	26%	8%	6%	16%	10%	8%	5%	13%	7%	6%	7%	7%	9%	3%	17%
Code Signals																				
After Code Snippet																				
(AC)	97%	90%	88%	80%	98%	80%	89%	96%	71%	74%	93%	100%	28%	94%	97%	86%	89%	82%	99%	54%
Before Code Snippet					1.1															
(BC)	3%	10%	12%	20%	2%	20%	11%	4%	29%	26%	7%		72%	6%	3%	14%	11%	18%	1%	46%
Technical Signals																				
Contribution Activity																				
(CA)	47%	65%	48%	36%	—	18%	11%		35%	20%	19%	5%	18%	24%	43%	12%	11%	28%	5%	11%
Commit Details												1.1				•				
(CD)	7%	1%	—	2%	—	2%	19%	—	_	—	—	1%	9%	3%	—	3%	—	9%	3%	3%
Contribution Heat Map										•										
(HM) Dull Dequest Title	14%	16%	17%	12%	_	8%	11%	25%	13%	8%	23%	28%	10%	14%	14%	13%	26%	19%	44%	18%
Pull Request Thie	•	•	•																	• ~
(P1) Popular Papasitorias	2%	3%	3%	9%	63%	23%	20%	18%	17%	28%	33%	24%	18%	7%	8%	6%	25%	15%	13%	5%
(RF)	2207-	150%	170%	2807-	1207-	2607-	1107-	1607-	170%	120%	1 / 07-	1107-	120%	2207-	2207-	2207-	20%-	160%	2007-	1507-
Submission Details	23%	13%	17%	28%	1270	20%	1170	40%	17%	13%	14%	11%	1370	23%	23%	3270	270	10%	30%	43%
(SD)	6%	<u> </u>	15%	13%	25%	24%	28%	10%	18%	31%	12%	32%	32%	28%	13%	35%	36%	13%	6%	18%
Social Signals																				
Avatar Image																				
(AI)	25%	20%	51%	28%	13%	16%	7%	64%	26%	52%	35%	33%	7%	24%	50%	21%	74%	42%	35%	46%
Display Name																				
(DN)	16%	24%	4%	8%	_	3%	5%	12%	11%	—	—	—	5%	8%	14%	5%	14%	11%	—	11%
Followers/Following														•		1.1				
(FF)	6%	19%	19%	6%	—	11%	—	3%	—	—	—	—	—	2%	—	2%	—	—	—	—
(RE) (RE)	_	_	_	_	_	_	_	- 5%	_	_	_	_	_	_	_	_	_	• 1%	_	_
Repository Stars																				
(RS)	45%	21%	17%	_	12%	32%	_	3%	14%	_	3%		_	8%	_	22%	_	- 5%	_	13%
To Merge																				
(TM)	6%	4%	_	42%	70%	29%	39%		28%	13%	58%	57%	63%	44%	20%	24%	3%	11%	65%	21%
User Details											•									
(UD)	2%	13%	9%	16%	5%	9%	49%	14%	20%	35%	5%	10%	25%	13%	16%	26%	10%	29%	_	9%

Social Coding in GitHub: Transparency and Collaboration in an Open Software Repositorv

> Laura Dabbish, Colleen Stuart, Jason Tsay, Jim Herbsleb School of Computer Science and Center for the Future of Work, Heinz College Carnegie Mellon University 5000 Forbes Ave., Pittsburgh, PA 15213 {dabbish, hestuart, itsay, idh}@cs.cmu.edu

Previous studies were done post factum

Further insight into the decision making

Influence of Social and Technical Factors for Evaluating Contribution in GitHub Jason Tsay, Laura Dabbish, James Herbsleb School of Computer Science and Center for the Future of Work, Heinz College Carnegie Mellon University 5000 Forbes Ave., Pittsburgh, PA 15213 USA {jtsay, dabbish, jdh}@cs.cmu.edu

i Closed °⊱ Merged



Eye tracking offers a holistic perspective to

the story

process

RESEARCH QUESTIONS



How do programmers review pull requests?



Where do programmers think they look and where they really look?







- cell(2,2) = Player1_filled; cell(1,2) = Player2_filled; cell(0,2) = Player1_filled;
- 42 +
- 43 public void testCheckTurn(){
- assertEquals(play(Player1, cell(1,0)), "Oops it's not quite your turn. You have to wait.") 44 45 +

Unreasonable Code Snippet:

- protected void setUp() { 40
- 41 + cell(0,0) = Player2_filled; cell(1,1) = Player1_filled; cell(1,0) = Player2_filled;
- 42 +
- public void test1(){ 43
- 44 assertEquals(play(Player1, cell(0,0)), "Great job! It is now the next player's turn")
- 45 + }

No. of Participants w/ Overlap Between Phases

Both social and technical aspects are being taken into consideration when deciding upon pull request acceptance.

Future work will study how the execution of concealing or amplifying these signals affect developers across the identity spectrum and development experiences at scale.

