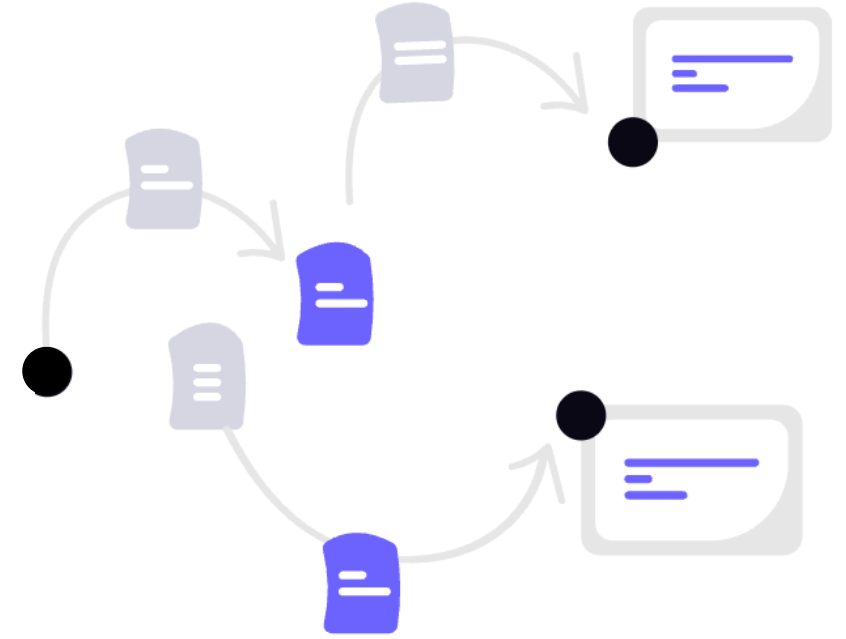


# Beyond Adoption: *Evolution and Impact* of Codes of Conduct on OSS



**Jiayi Sun**

Hongbo Fang

Junming Zhang

Jiakai Shi

Ruitao Lai

Anita Ihuman

Richard Littauer

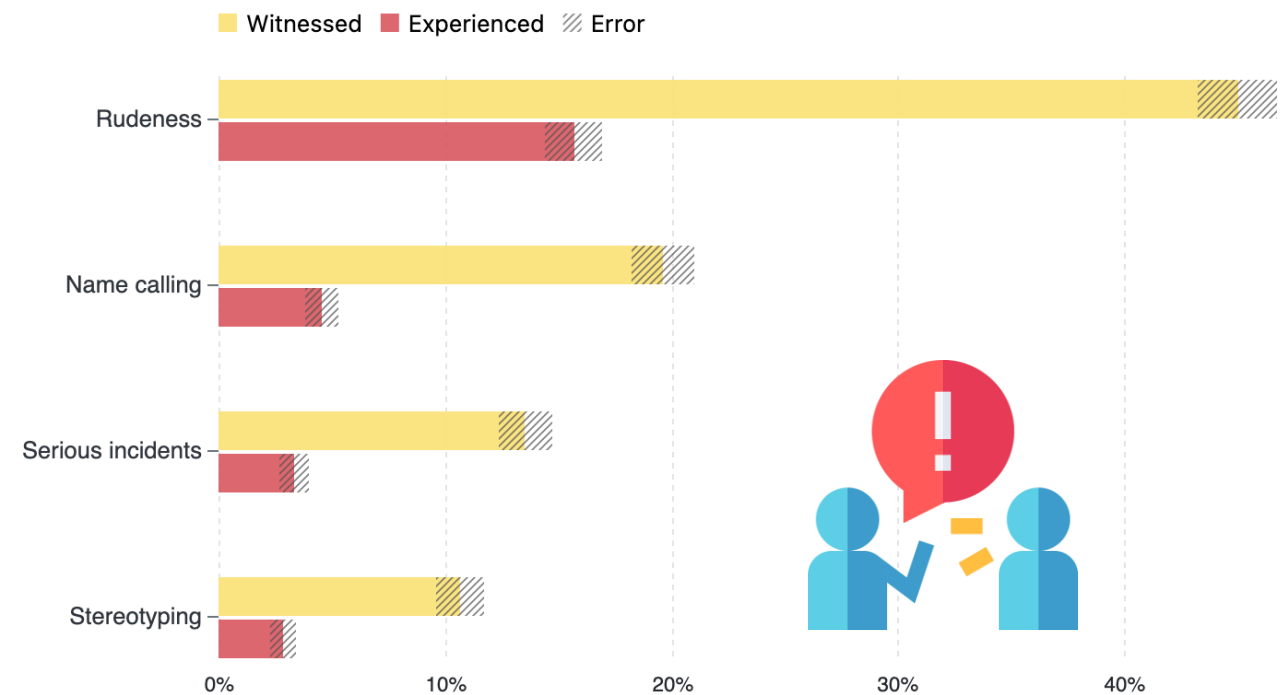
Shurui Zhou

# Conflicts Emerge as OSS Communities Scale

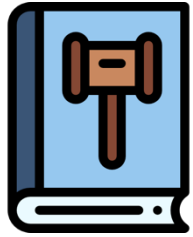
- ~17% experienced serious incidents
- Toxic behavior may emerge as communities scale
- Causing attrition · disengagement · sustainability risks

Fig2. - Negative behavior in open source

Source: opensourcesurvey.org

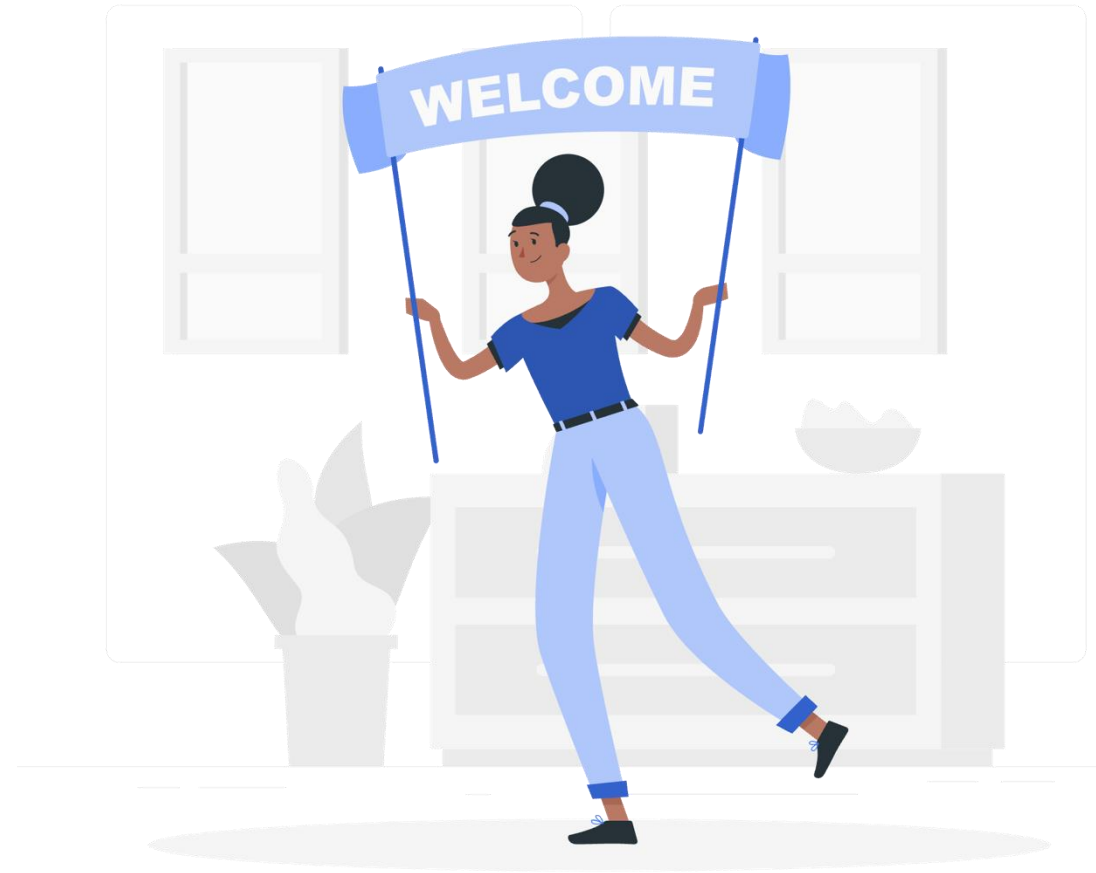


<https://opensourcesurvey.org/2017/>



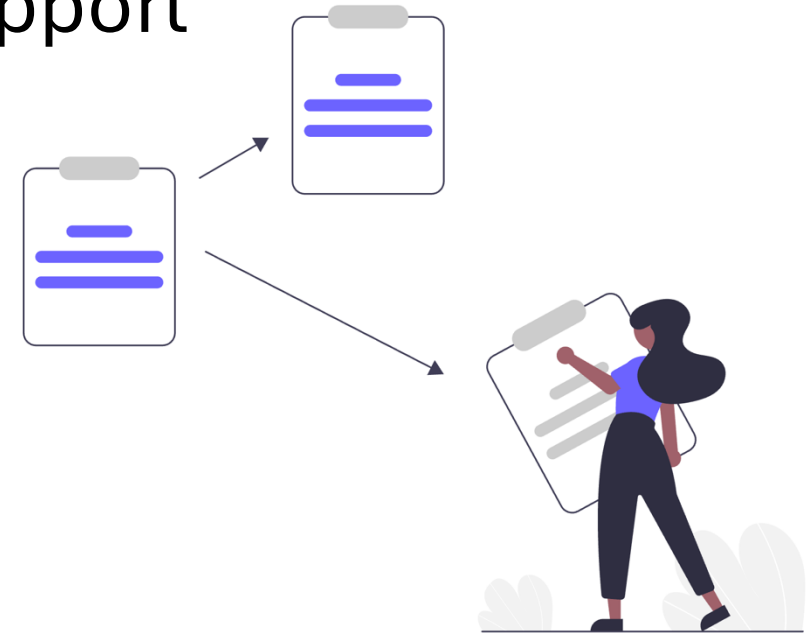
# Code of Conduct (CoC) in OSS

- Community culture
- Inclusivity
- Participation guide



# Standardizing Codes of Conduct

Templates → customization → platform support



django



ubuntu

# CoC Templates Accelerate the Adoption

Add a code of conduct to your project

## Django

Suitable for large communities and events

## Contributor Covenant

Recommended for projects of all sizes

## **Community name** Code of Conduct

Like the technical community as a whole, the **Community name** team and community is made up of a mixture of professionals and volunteers from all over the world, working on every aspect of the mission - including mentorship, teaching, and connecting people.

Diversity is one of our huge strengths, but it can also lead to communication issues and unhappiness. To that end, we have a few ground rules that we ask people to adhere to. This code applies equally to founders, mentors and those seeking help and guidance.

This isn't an exhaustive list of things that you can't do. Rather, take it in the spirit in which it's intended - a guide to make it easier to enrich all of us and the technical communities in which we participate.

This code of conduct applies to all spaces managed by the **Community name** project or **Governing body**. This includes IRC, the mailing lists, the issue tracker, DSF events, and any other forums created by the project team which the community uses for communication. In addition, violations of this code outside these spaces may affect a person's ability to participate within them.

If you believe someone is violating the code of conduct, we ask that you report it by emailing **Email address**. For more details please see our **Link to reporting guidelines**

To adopt **Django**, enter your details. You'll have a chance to review before committing a `CODE_OF_CONDUCT.md` file to a new branch or the root of your project.

### Link to reporting guidelines

An optional link to guidelines for how reports of unacceptable behavior will be handled.

### Community name

### Governing body

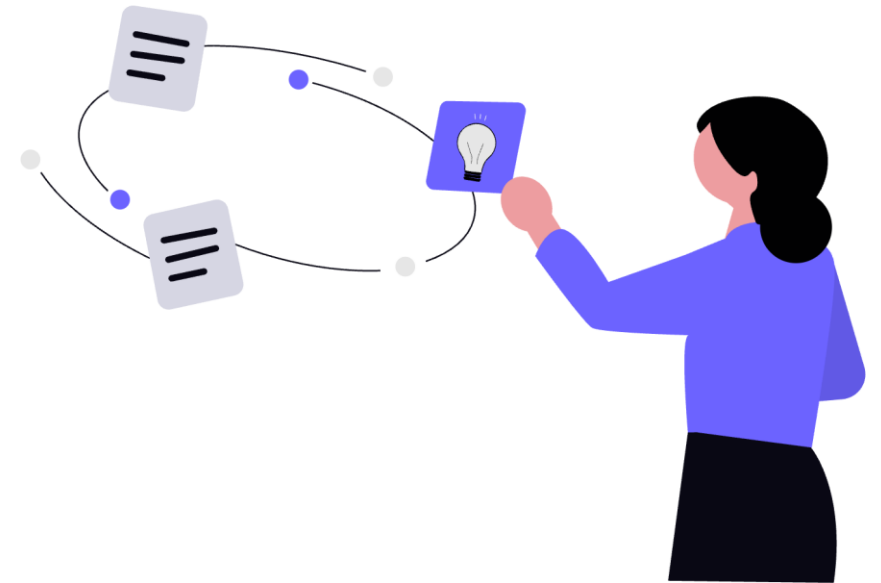
### Email address

### Link to faq

Review and submit

# What We Know about CoC

- **Why adopt CoCs**
  - To prevent harassment and foster healthy & inclusive community environment.
- **What do CoCs address**
  - Language, behaviors and participation guidelines.
- **Perception on CoC from minority groups**
  - A signal of safety for newcomers to choose to participate.



However

# Existing **Issues** with CoC

- **Lack of effective enforcement**
  - *Can signal "a false sense of safety"*
- **Community resistance**
  - *Prioritize meritocracy with "No CoC" adoption*
- **Debated effectiveness**
  - *Conflicting evidence on community improvements*

[Li et al. 2021, Frluckaj et al. 2025, Robson 2018, Singh et al. 2021]



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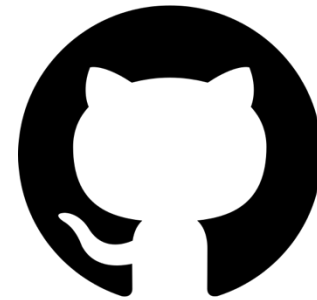


r/linux · 8y ago  
[deleted]

## No Code of Conduct: A Code of Conduct for Adults in Open Source Software

# domgetter/NCoC

No Code of Conduct: A Code of Conduct for Adults  
in Open Source Software



5  
Contributors

10  
Issues

2k  
Stars

117  
Forks

*“Good communities don’t need  
a Code of Conduct.”*

*“Respect should come from  
shared norms, not written rules.”*

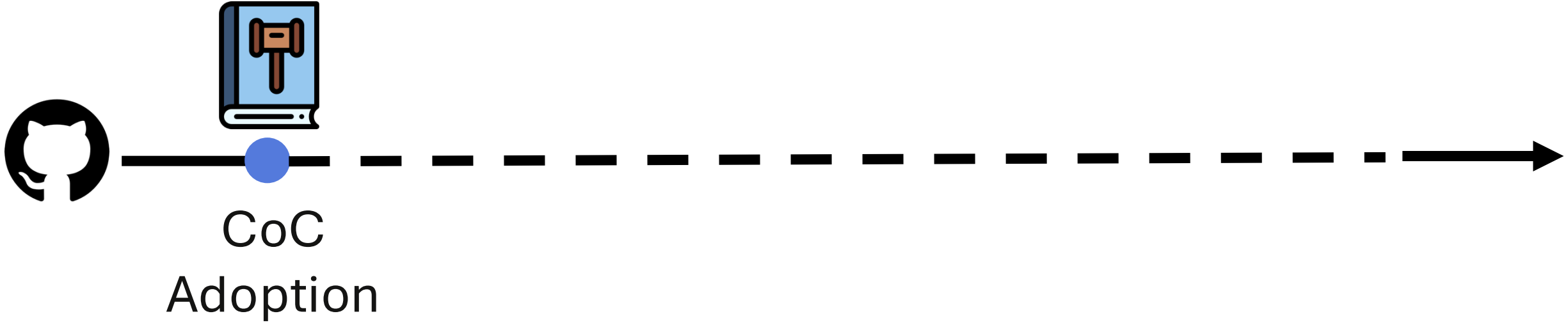
# Existing **Issues** with CoC

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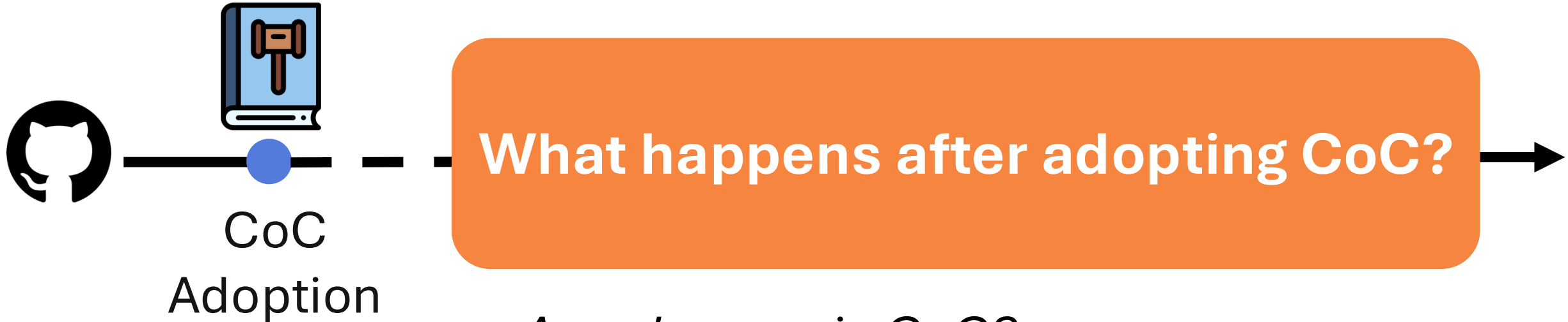
[Li et al. 2021, Frluckaj et al. 2025, Robson 2018, Singh et al. 2021]



# From a Long-Term Perspective



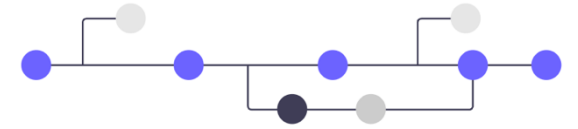
# From a Long-Term Perspective



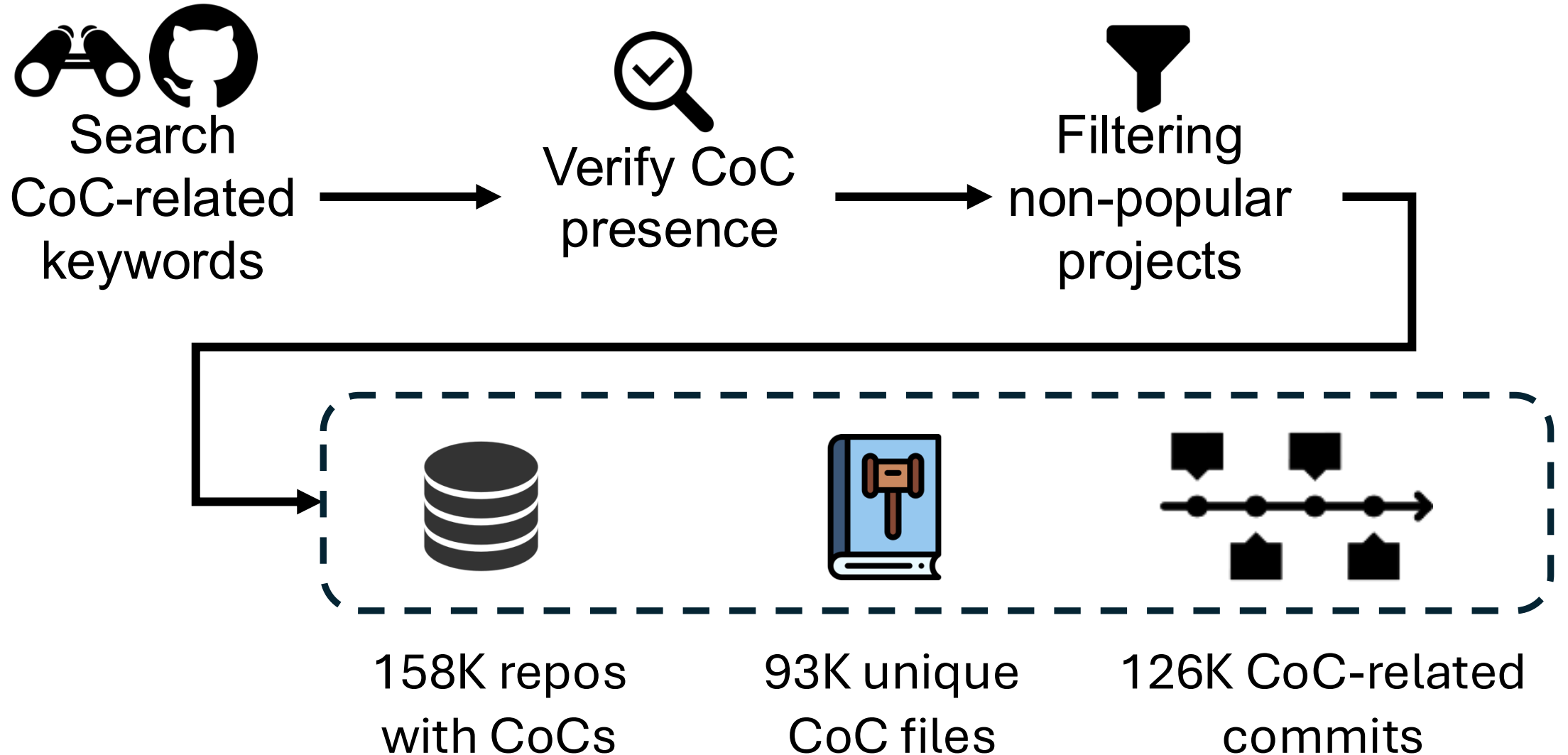
- *Any changes in CoC?*
- *Does it help resolve conflicts, attract new contributors, improve diversity, or retain existing members?*
- ...

# Research Questions

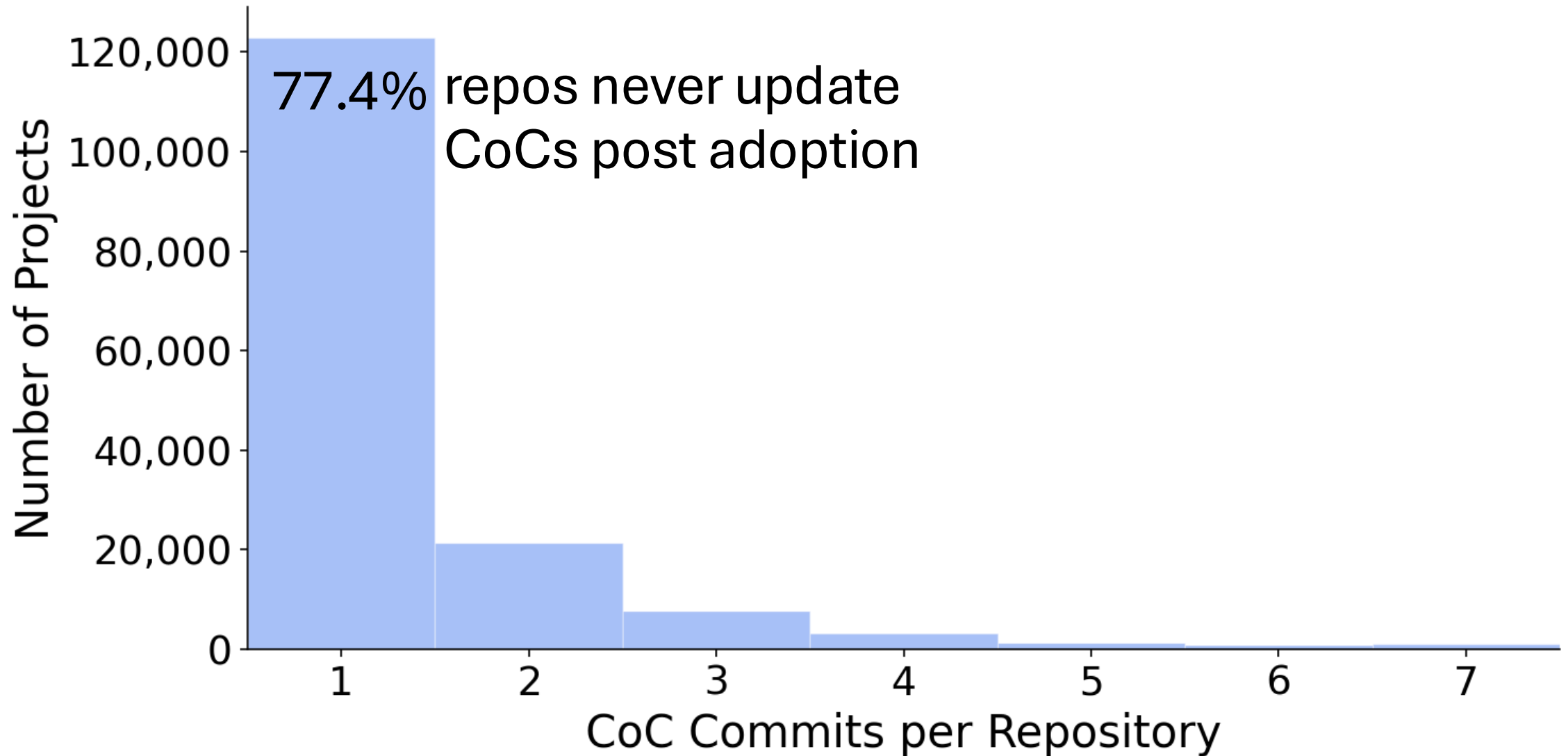
- **RQ1 - How CoCs *Evolve* in OSS**
  - Update intention
  - Update pattern over time
- **RQ2 – *Impact* of CoC on Engagement**
  - Adoption impact
  - Update-engagement correlation



# Data Collection

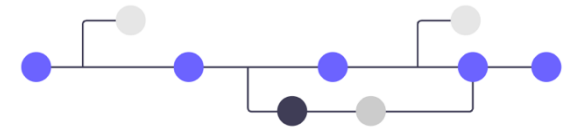


# CoCs Are Rarely Maintained After Adoption

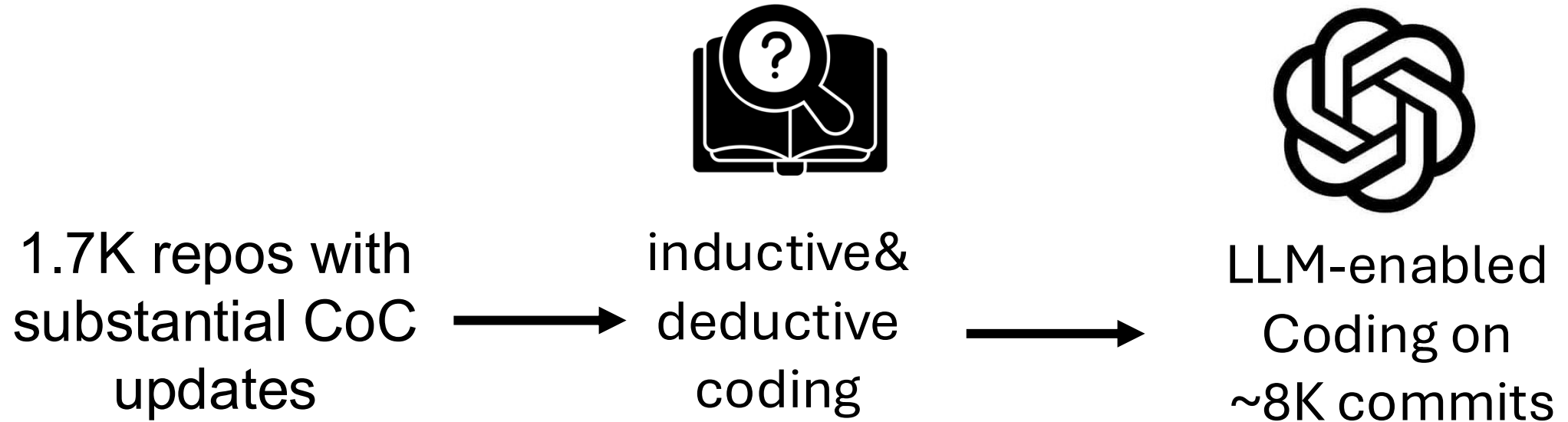


# Research Questions

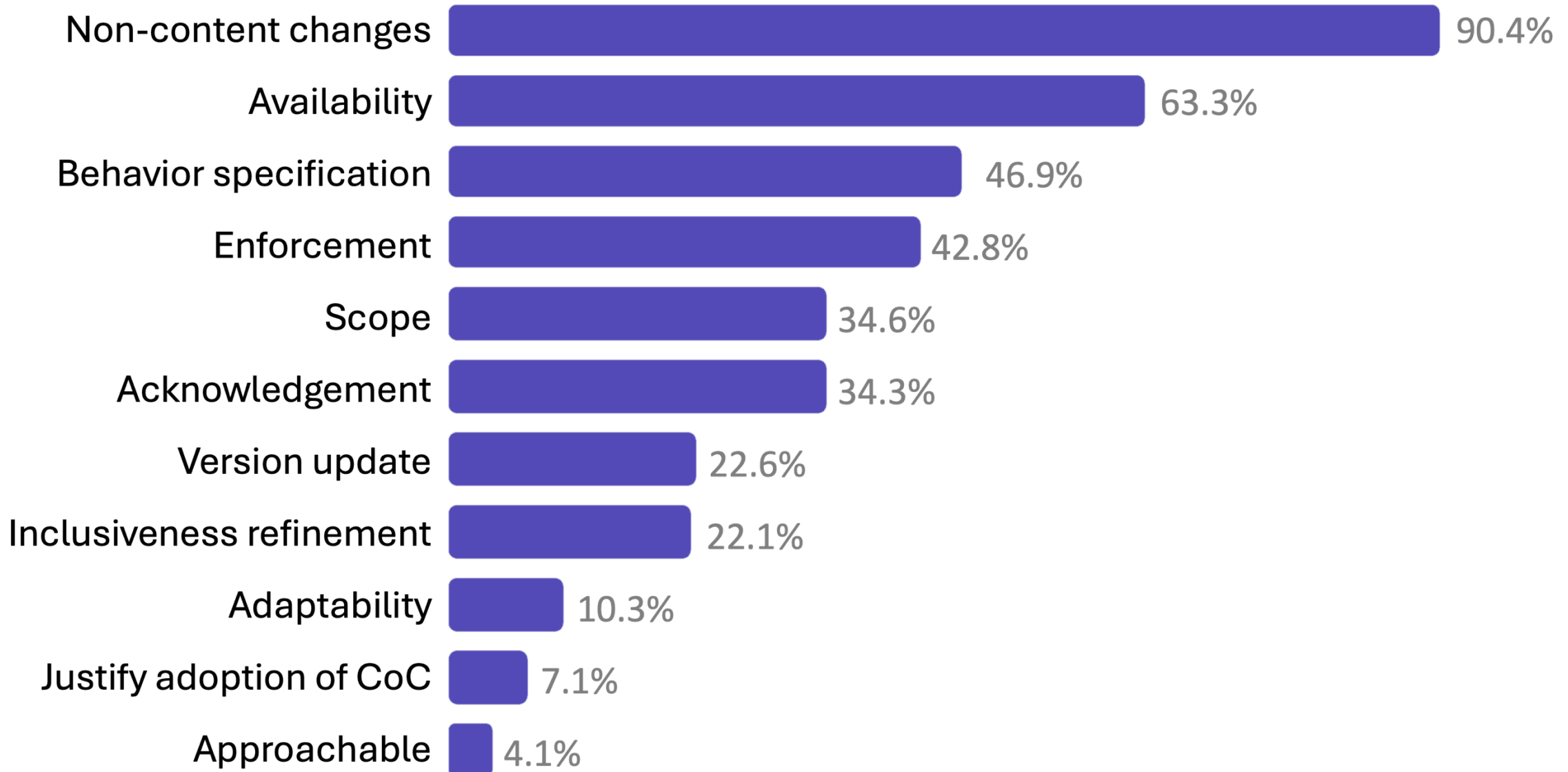
- **RQ1 - How CoCs Evolve in OSS**
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# Identifying CoC Update Intentions

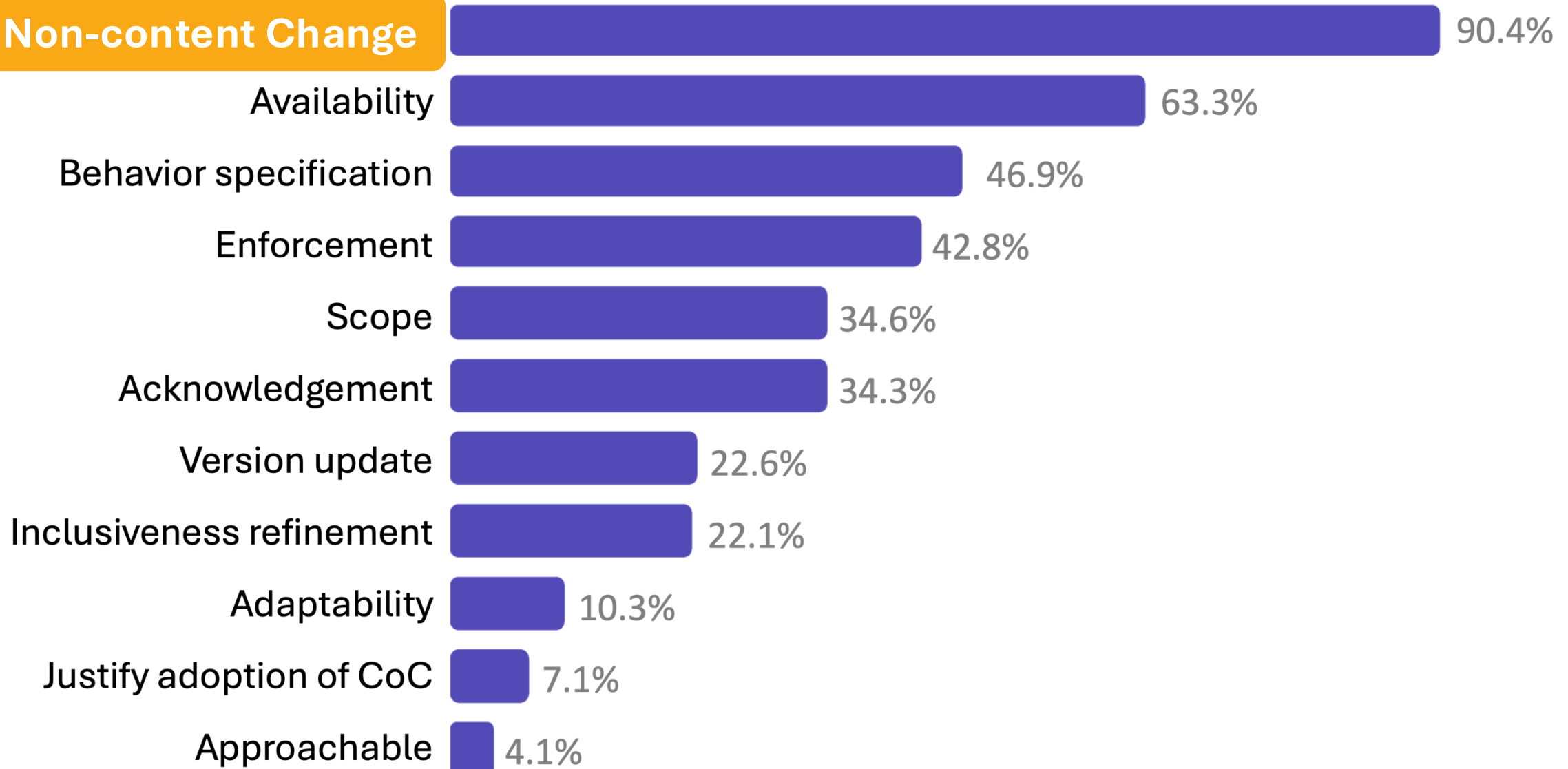


# 11 Types of CoC Update Intentions

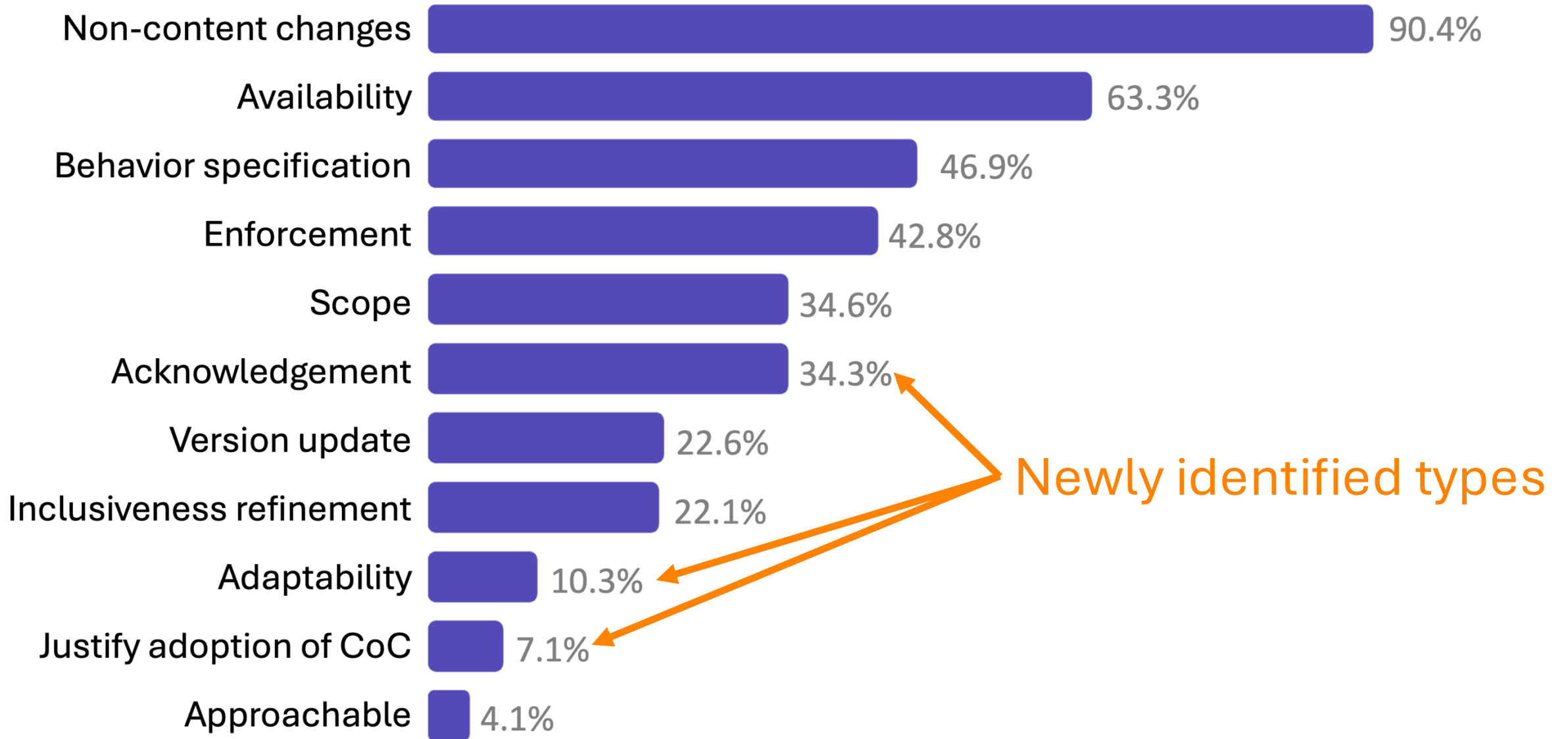


# 11 Types of CoC Update Intentions

**Non-content Change**



# 11 Types of CoC Update Intentions



# CoC Update History of elixir

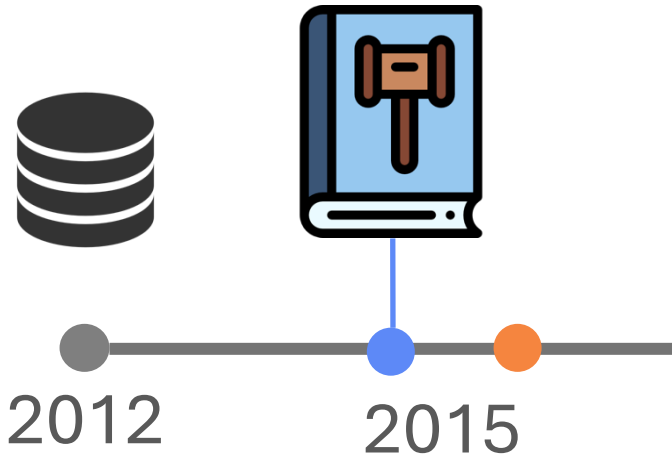
☆ Star 26.4k



- Repo Creation
- CoC Adoption
- CoC Updates

# CoC Update History of elixir

☆ Star 26.4k



- Instances of abusive, harassing, or otherwise unacceptable behavior may be reported by opening an issue or contacting one or more of the project maintainers.

+ Instances of abusive, harassing, or otherwise unacceptable behavior may be reported by sending an e-mail to [elixir-lang-conduct@googlegroups.com](mailto:elixir-lang-conduct@googlegroups.com).

● Repo Creation

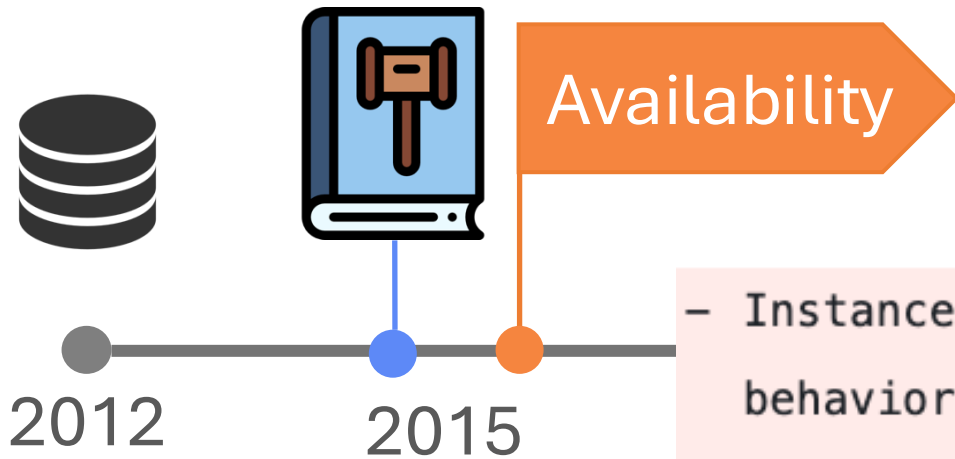
● CoC Adoption ● CoC Updates

# CoC Update History of elixir



Star

26.4k



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● Repo Creation

● CoC Adoption ● CoC Updates

# CoC Update History of elixir

☆ Star 26.4k



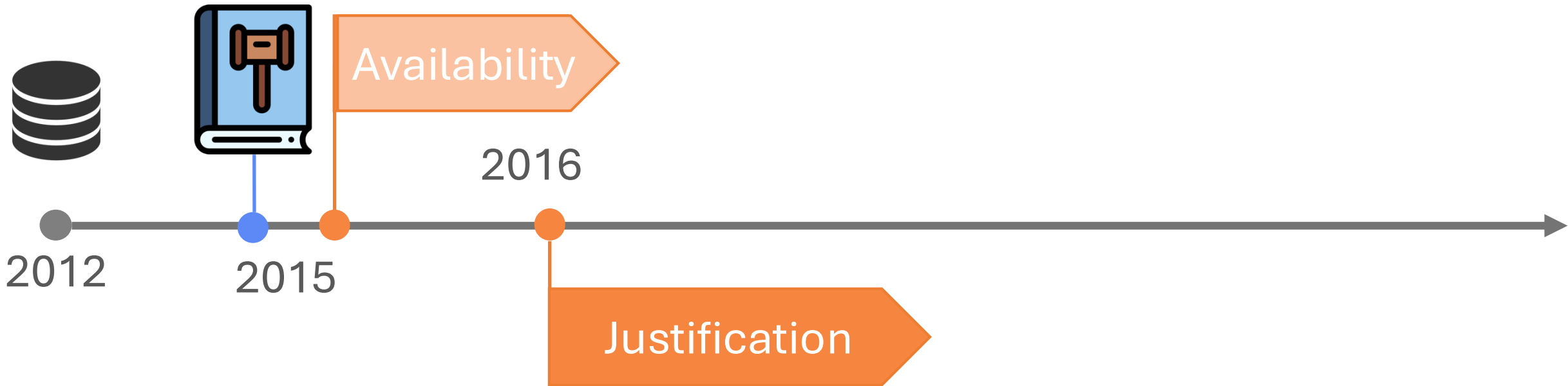
- Repo Creation
- CoC Adoption
- CoC Updates

+ ## Why have a Code of Conduct?

+ The goal of the Code of Conduct is to specify a baseline standard of behavior so that people with different social values and communication styles can talk about Elixir effectively, productively, and

# CoC Update History of elixir

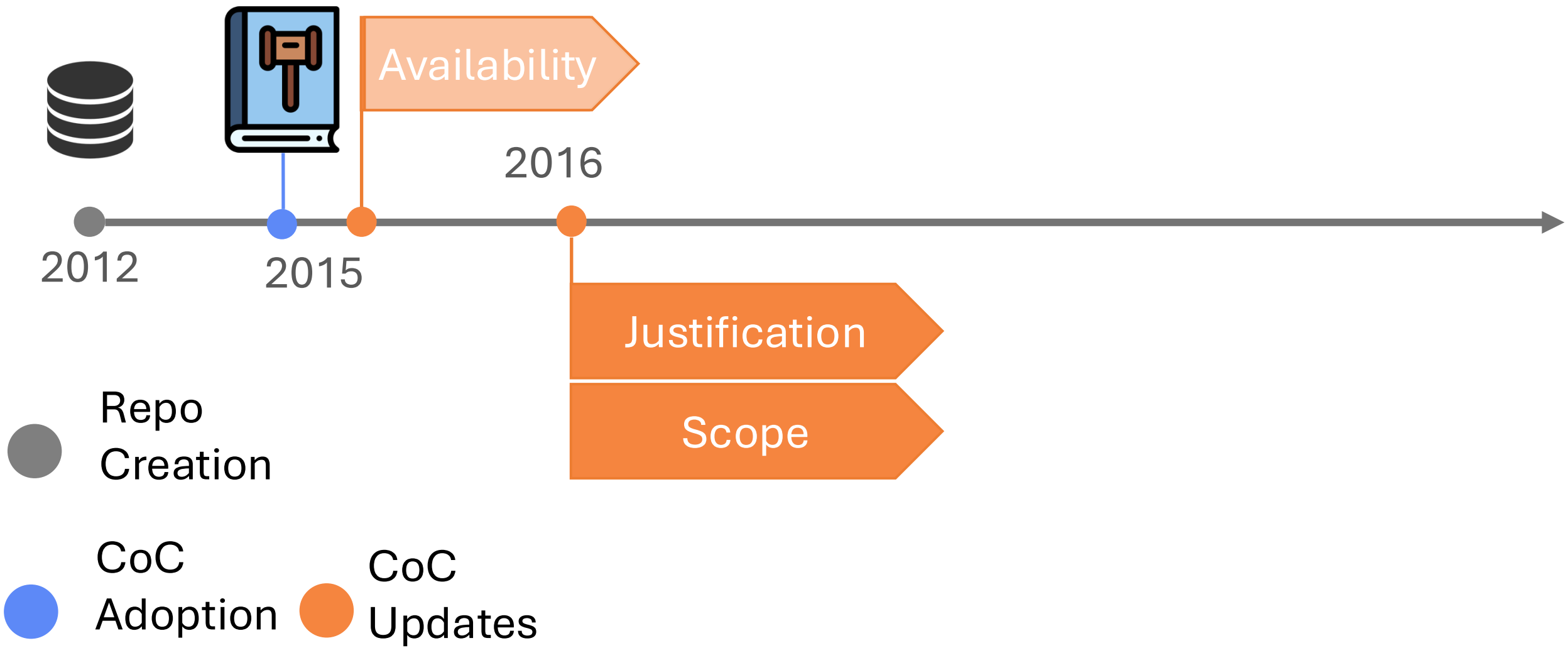
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- Repo Creation
- CoC Adoption
- CoC Updates

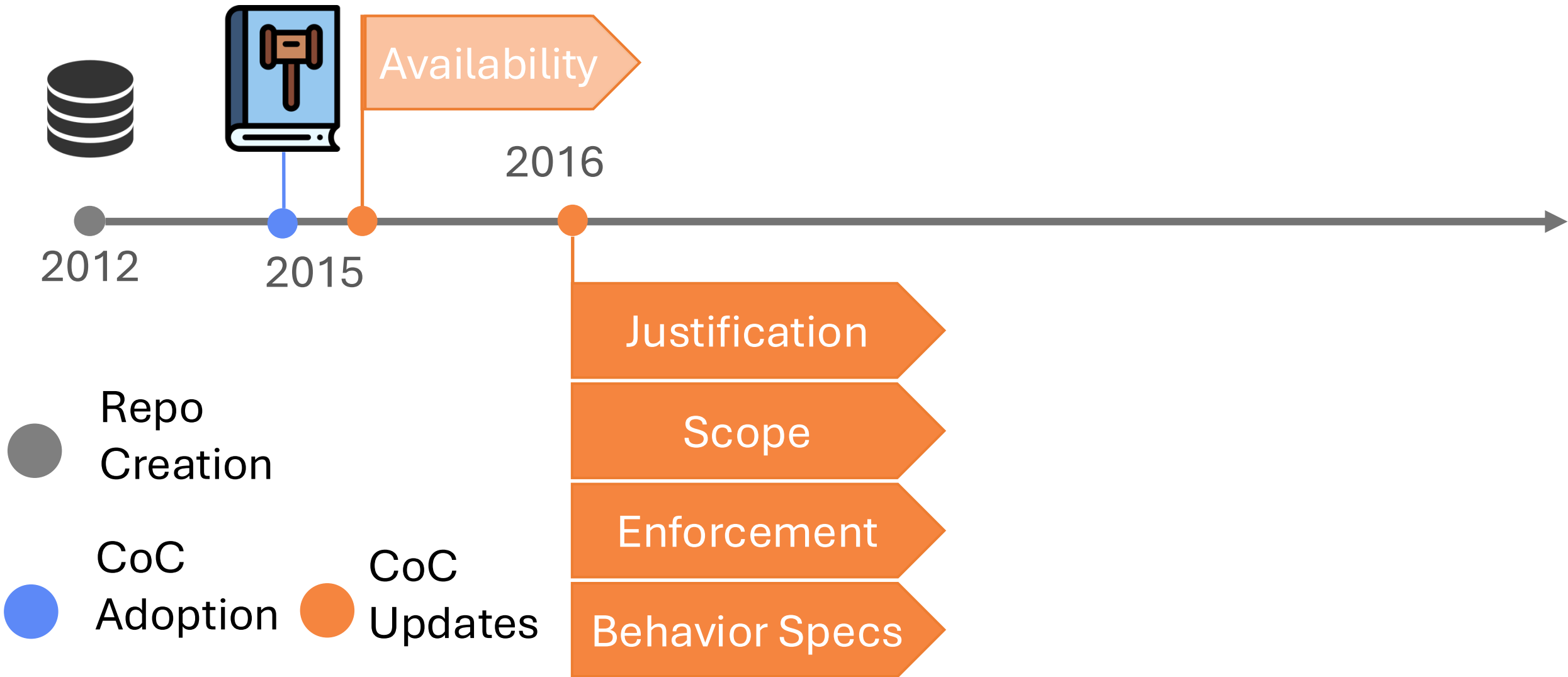
# CoC Update History of elixir

☆ Star 26.4k



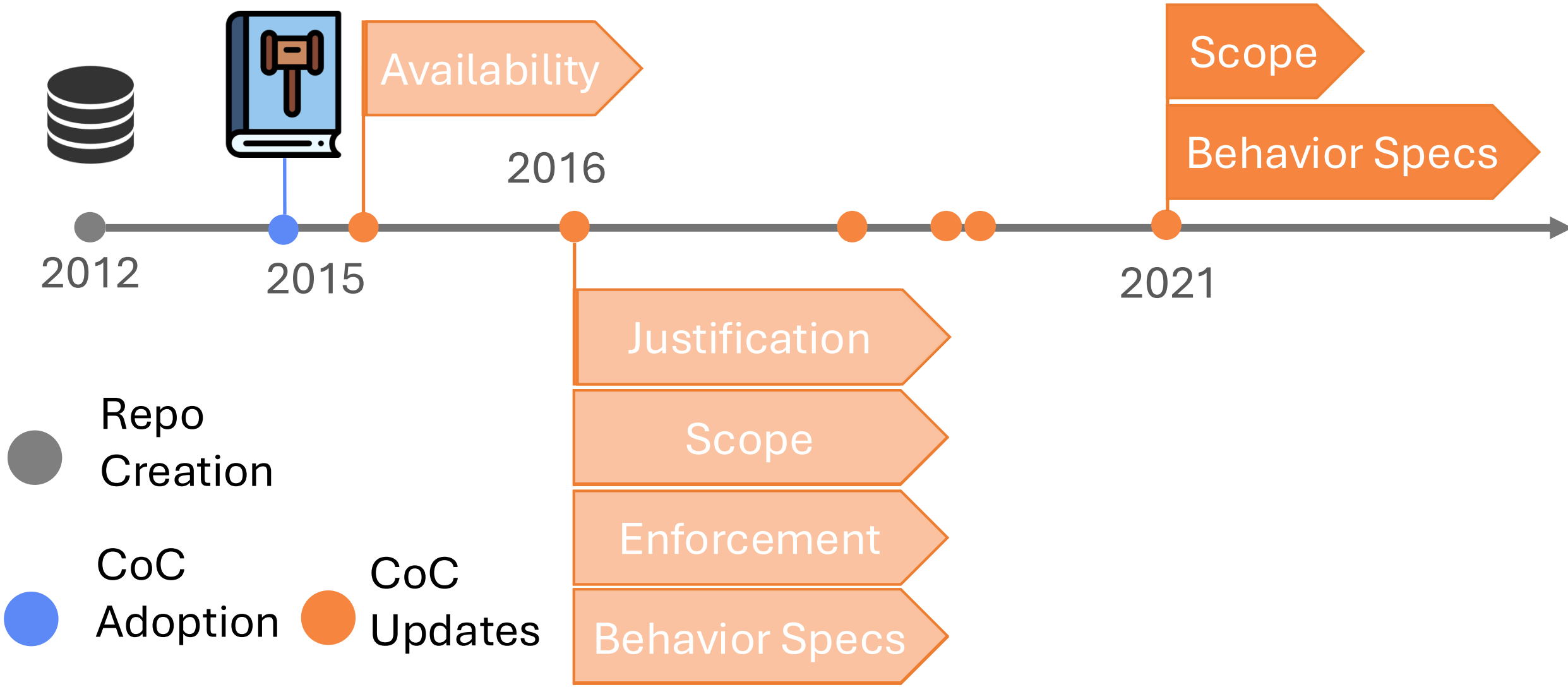
# CoC Update History of elixir

☆ Star 26.4k



# CoC Update History of elixir

☆ Star 26.4k



# Analyze CoC Update History of Each Repo



elixir



Repo  
Creation

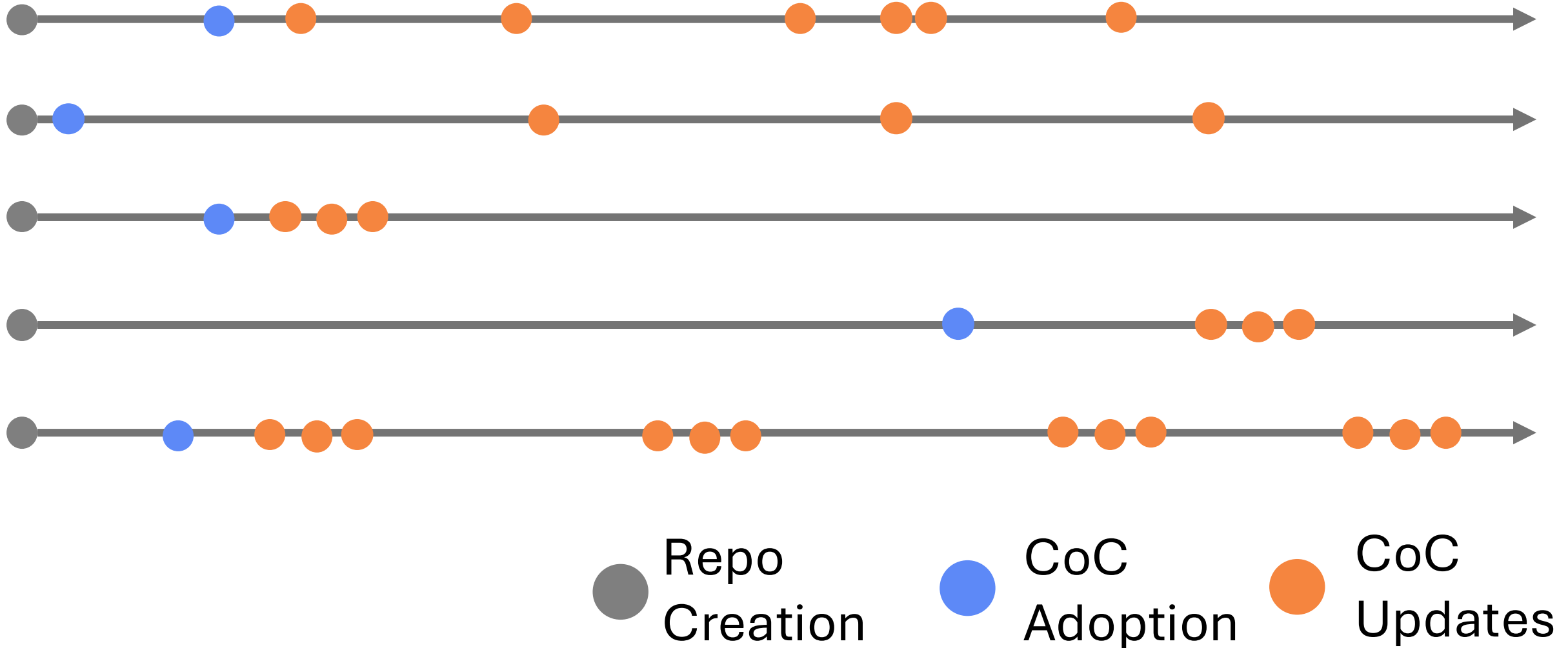


CoC  
Adoption

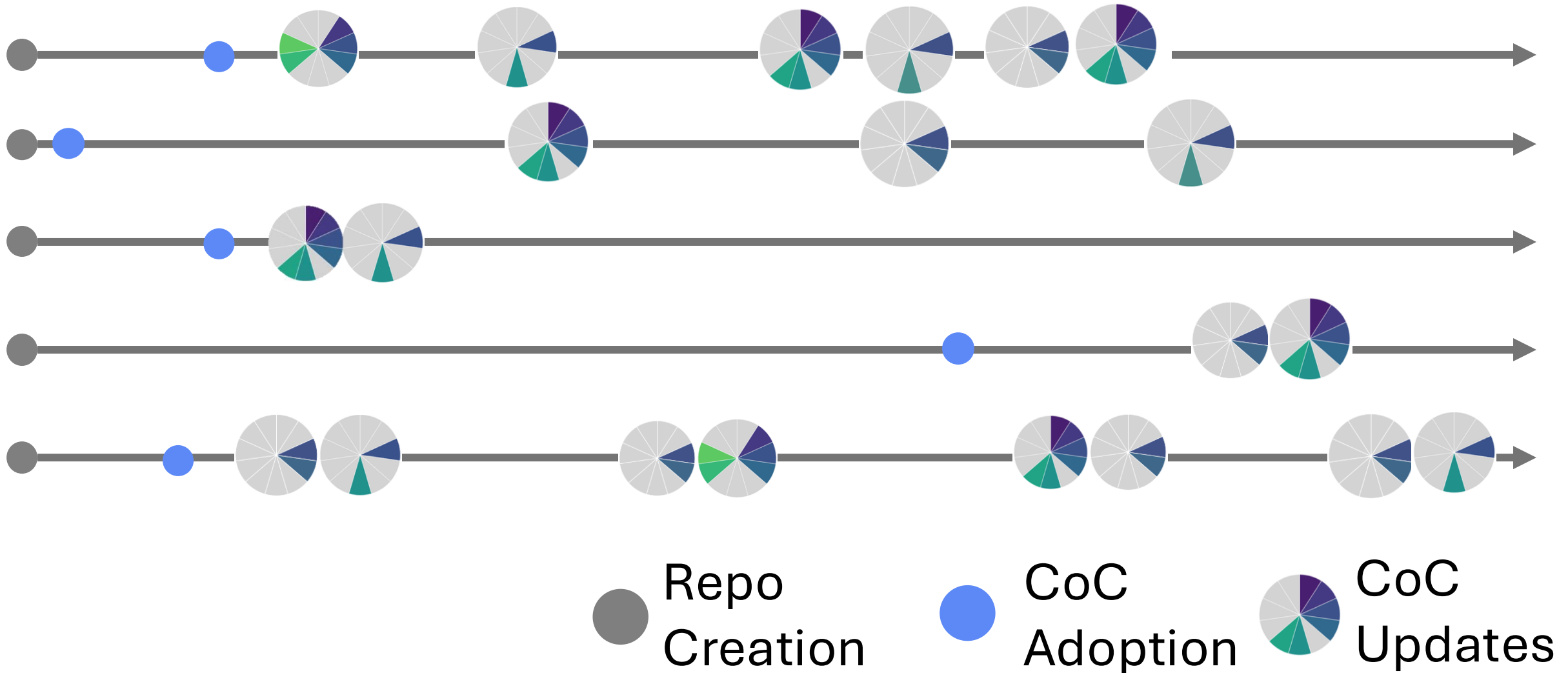


CoC  
Updates

# Update Frequency & Types Vary Across Projects



# Update Frequency & Types Vary Across Projects



# More Details in the Paper

Category	Pattern	#Repos (%)
Consistent Major Updates		13 (0.85)
Mid-Late Major Update		34 (2.22)
Early-Late Major Update		26 (1.69)
Early-Mid Major Updates		21 (1.37)
Early Major Updates Only		209 (13.62)
Mid-Stage Major Updates Only		164 (10.69)
Late Major Updates Only		162 (10.56)
Minimal or No Major Updates		905 (59.0)

## Beyond Adoption: Examining the Evolution and Impact of Codes of Conduct on Open Source Communities

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University of Toronto

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University of Chicago

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University of Toronto

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University of Toronto

### Abstract

While open source software (OSS) communities thrive on collaboration, conflicts such as toxic behavior and discrimination can surface, threatening project sustainability. To address these concerns, many communities have adopted a Code of Conduct (CoC) as a mechanism for governing and moderating members' behavior. Prior research has explored the motivations behind CoC adoption and their content updates, but it remains unclear how different communities are using and maintaining CoCs over time after initial adoption and how adoption impacts communities. To bridge these gaps, in our study, we compile a large-scale dataset of CoCs along with their change histories from GitHub to quantitatively (1) understand the evolution of CoC content and identify change patterns across different communities, and (2) investigate the potential impact of CoC adoption on community engagement. Our results show that OSS communities with a CoC attract more new contributors in both the short- and long-term. However, CoC adoption also leads to a short-term increase in disengagement among existing contributors, with very limited effects on long-term disengagement. The insights from this study can provide guidance for maintaining CoCs and offer statistically significant evidence of their impact.

### CCS Concepts

• Human-centered computing → Open source software • General and reference → Empirical studies.

### ACM Reference Format:

Jiayi Sun, Hongbo Fang, Junning Zhang, Jiakai Shi, Ruitao Lai, Anita Lhumant, Richard Littauer, and Shurui Zhou. 2026. Beyond Adoption: Examining the Evolution and Impact of Codes of Conduct on Open Source Communities. In *2026 IEEE/ACM 48th International Conference on Software Engineering (ICSE '26)*, April 12–18, 2026, Rio de Janeiro, Brazil. ACM, New York, NY, USA, 13 pages. <https://doi.org/10.1145/3749163.3752268>

### 1 Introduction

With the growing popularity of social coding platforms like GitHub, more developers are now contributing to open source software (OSS) [14]. As communities grow, conflicts could emerge, such as toxic and discriminatory speech, entitlement, and aggression [51]. According to a survey conducted by GitHub in 2017, cumulatively

around 17% of contributors have experienced or witnessed serious incidents, such as sexual harassment, stalking, or doxing [49]. Conflicts can result in an unhealthy community culture, developers abandoning projects, and an increased workload for already overworked maintainers, leading to a lack of sustainability for OSS projects [43]. Given the critical role of OSS in modern digital infrastructure, fostering welcoming communities could have a substantial impact on software development and the overall OSS ecosystem, which is crucial to global digital infrastructure.

To address conflicts, many OSS communities have adopted a Code of Conduct (CoC), a form of project governance. It can "define community standards, signal a welcoming and inclusive project, and outline procedures for handling abuse" [36]. It typically specifies expected behaviors from community members and consequences for violations of the CoC. OSS communities either craft their own CoC, or adopt existing templates and modify them for their own use, such as the Contributor Covenant [23], a widely-used CoC template that outlines standards for respectful and inclusive behavior among contributors. Similar moderation practices, including the establishment of community guidelines and mechanisms for reporting violations, are found in other online communities like Reddit [5].

CoCs were originally adopted by projects to improve the psychological and social well-being of contributors, which is a critical part of intrinsic ethical values [51], and to improve the long-term sustainability of OSS communities [77]. Despite the effort of adopting CoCs to address conflict and foster healthy communities, there are still existing challenges with CoCs in OSS communities, such as a lack of enforcement, as most CoCs do not outline an effective way to ensure compliance of contributors [43]. Also, many contributors and maintainers are against adopting CoCs in their community [43], holding that the value of meritocracy should be prioritized over community culture. Many consider improving Equity, Diversity, and Inclusion (EDI) to be a liberal political ideology [15, 43, 67], which can be polarizing to some community members. At the same time, while some existing work shows no statistically significant change in community diversity with a CoC [62], some studies show otherwise [49].

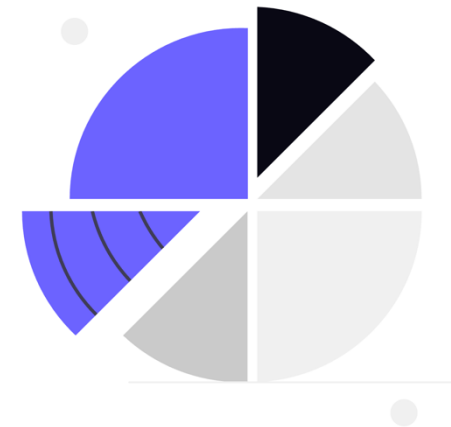
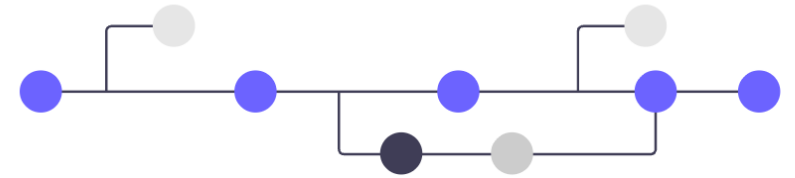
Moreover, prior research has qualitatively explored the motivations behind CoC adoption [69], the elements shaping CoC content, and the challenges of enforcement [43, 77]. Researchers have also investigated the impact of CoC adoption, particularly on diversity, but findings remain inconclusive, with some reporting positive effects while others find no statistically significant changes [17, 62, 69]. Therefore, the effectiveness of CoCs remains an open question, and there is no large-scale statistical evidence on the impact of CoC



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ICSE '26, Rio de Janeiro, Brazil  
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ACM ISBN 978-0-001-2025-9/2026/04  
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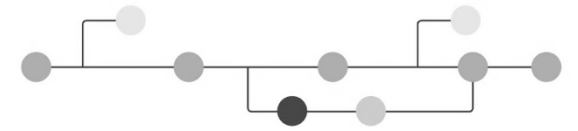
# Findings for RQ1 - How CoCs Evolve in OSS

- CoCs Are Not Maintained Equally across OSS
  - Majority (~59%): minimal updates
  - Minority (~6%): sustained updates
- Active maintenance emerges only in some projects



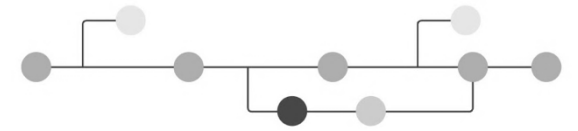
# Research Questions

- **RQ1 - How CoCs Evolve in OSS**
  - Update intention
  - Update pattern over time
- **RQ2 – Impact of CoC on Engagement**
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  - Update-engagement correlation



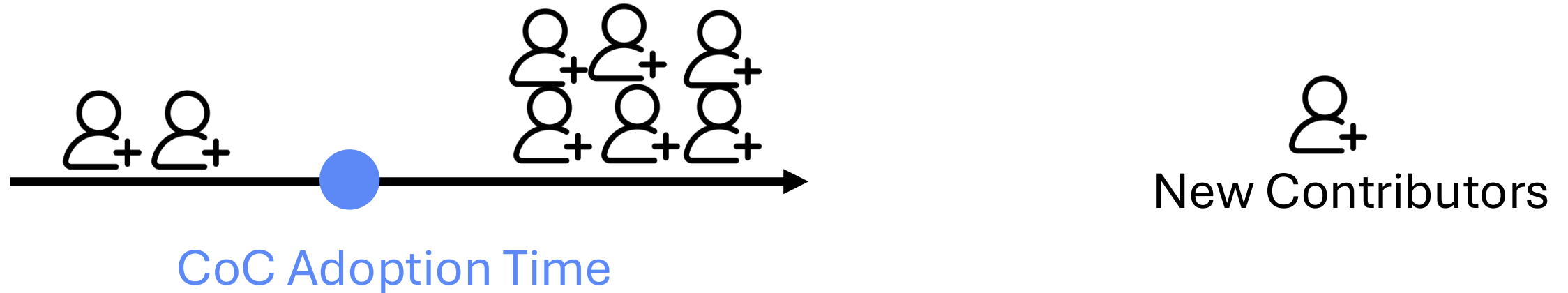
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# Within-Project Comparison Is Not Enough

- Before–after engagement changes can be misleading



# Within-Project Comparison Is Not Enough

- Before–after engagement changes can be misleading
- Confounding Factors?
  - Project popularity
  - Project maturity
  - Platform features
  - ....

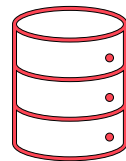


# Isolate CoC Effect to Infer Causal Relationship



CoC

Repos **adopted** CoC

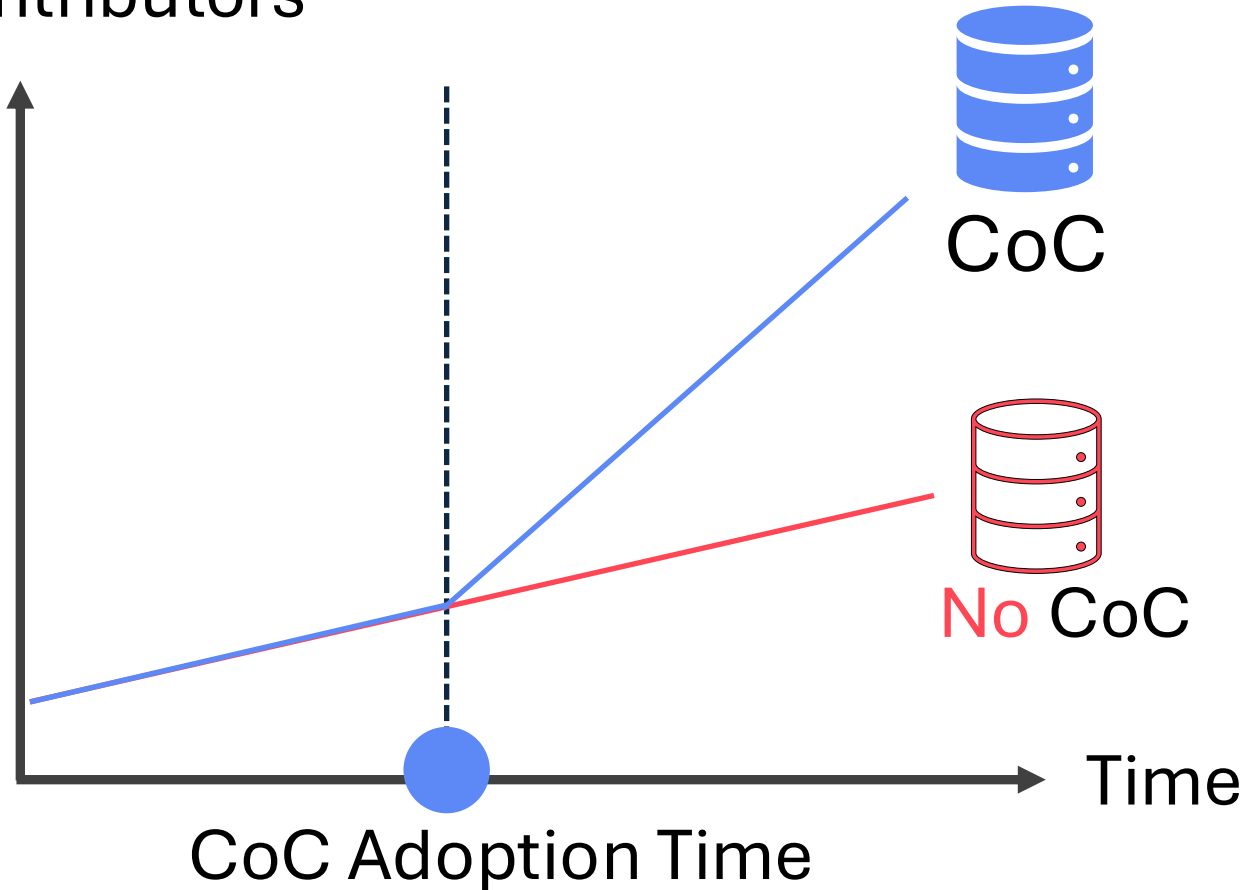


No CoC

Repos did **NOT** adopt CoC

# Isolate CoC effect to Infer Causal Relationship

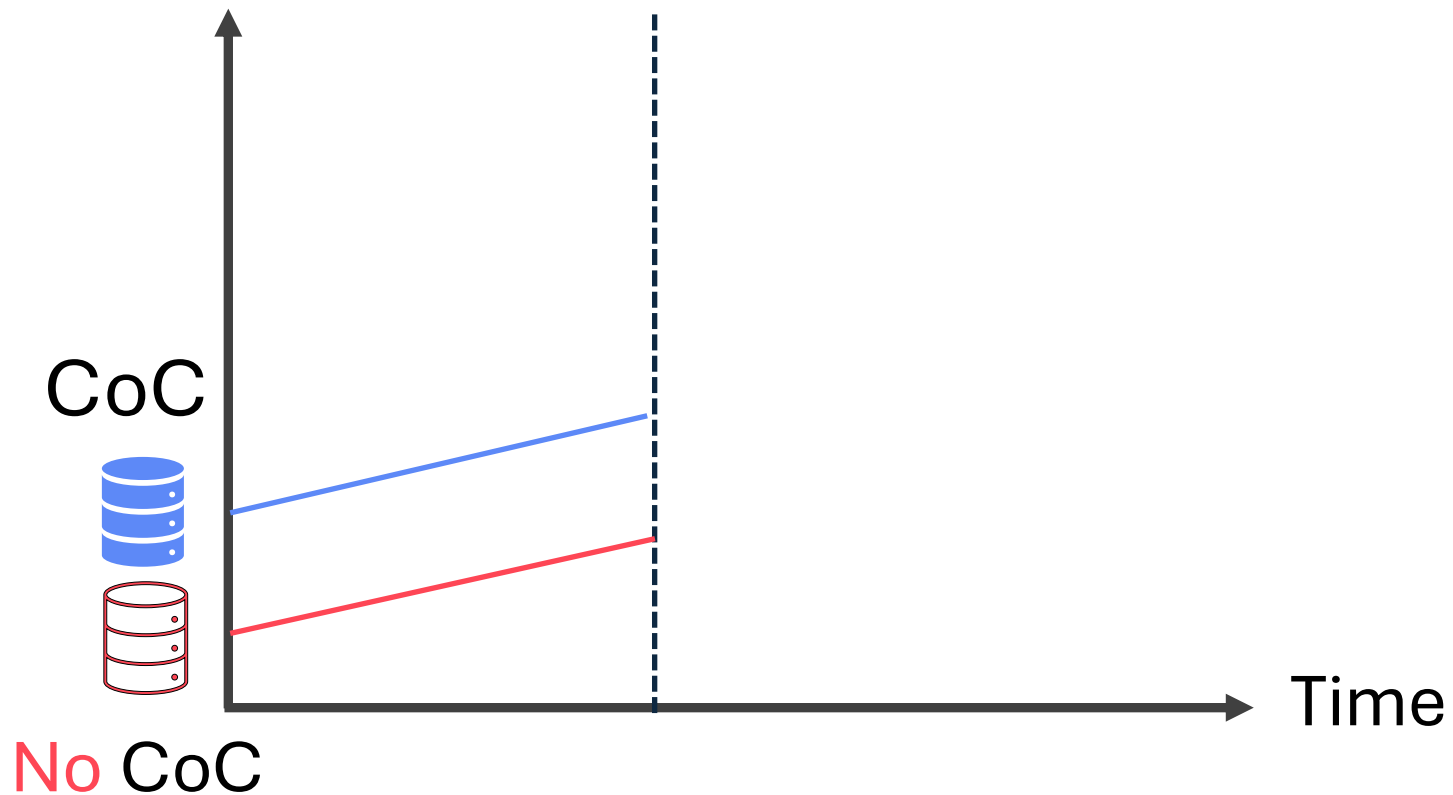
# New contributors



*what would have happened if these repositories had not adopted a CoC?*

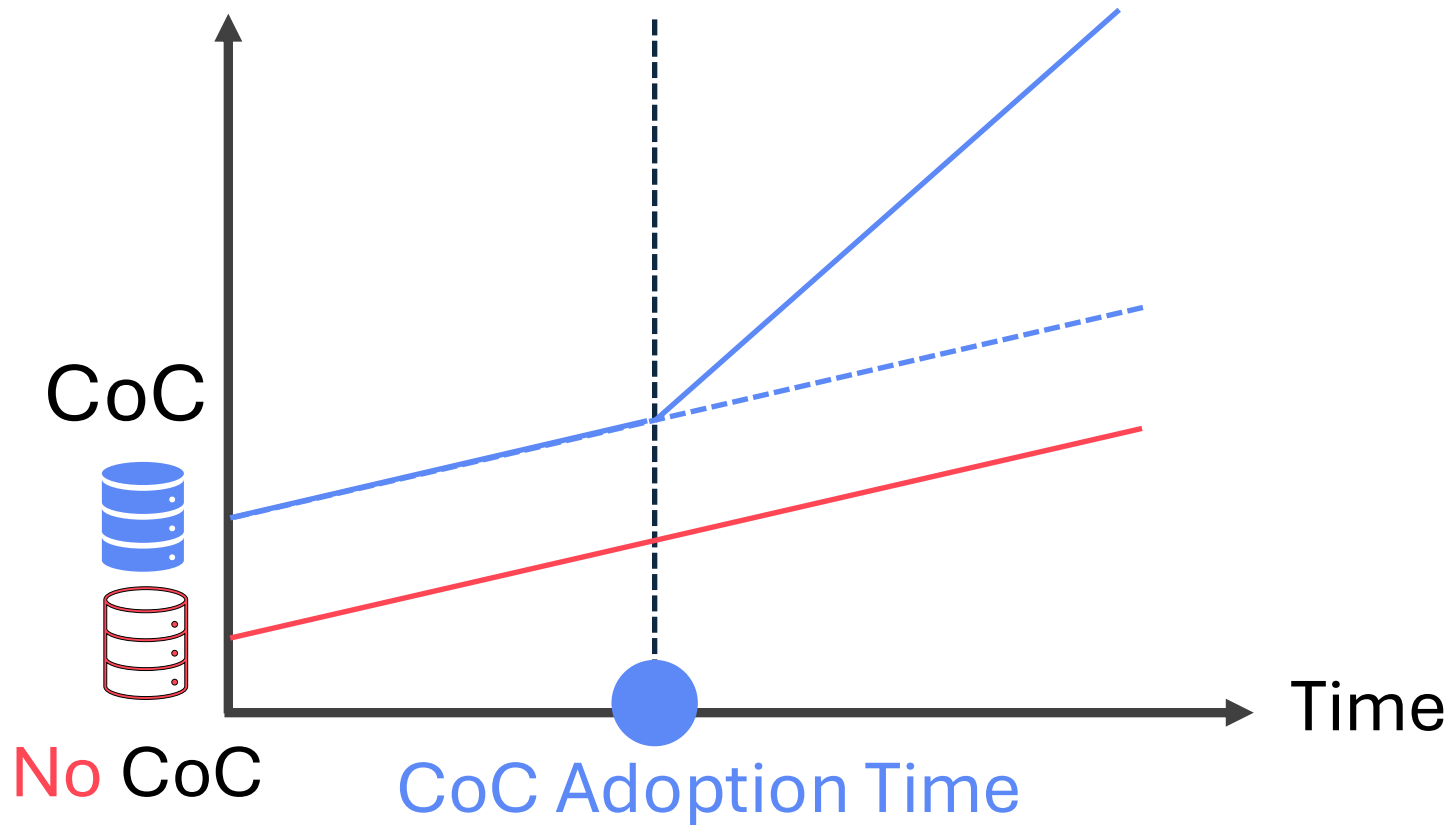
# Infer Causal Relationship Using Diff-in-Diff (DiD)

# New contributors



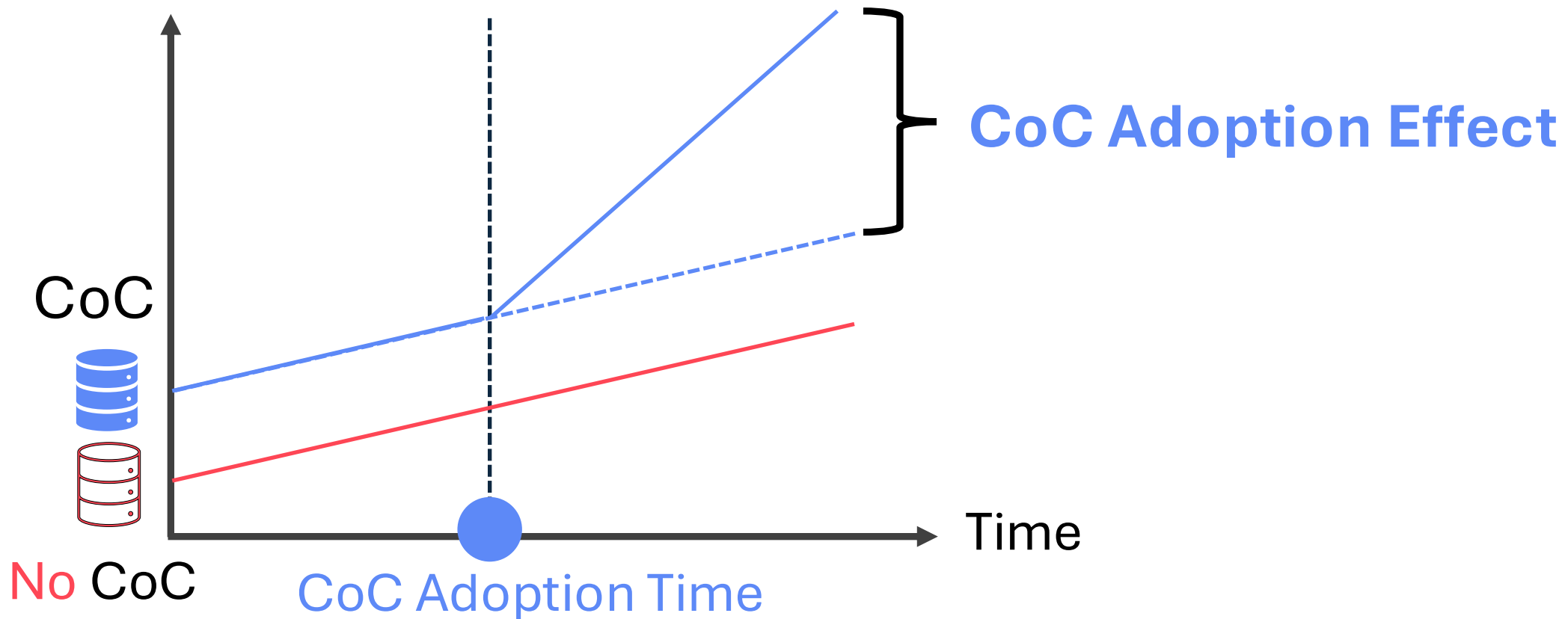
# Infer Causal Relationship Using Diff-in-Diff (DiD)

# New contributors



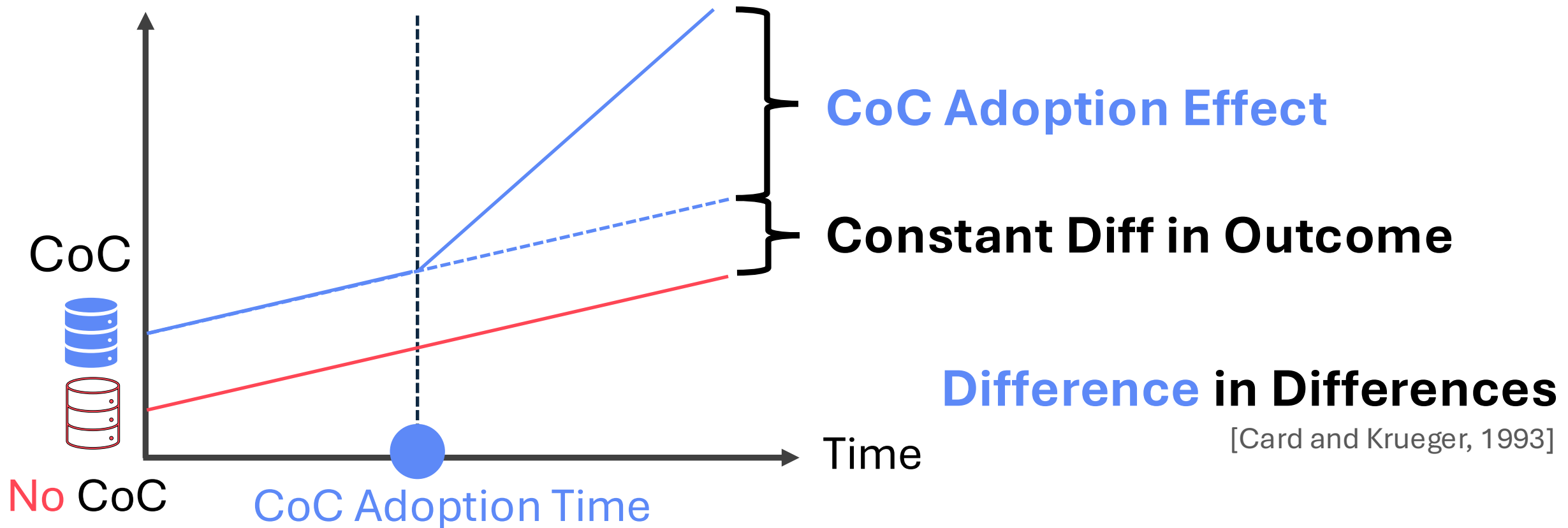
# Infer Causal Relationship Using Diff-in-Diff (DiD)

# New contributors



# Infer Causal Relationship Using **Diff-in-Diff (DiD)**

# New contributors



# Outcome Variables



New contributors joined



Existing contributors disengaged



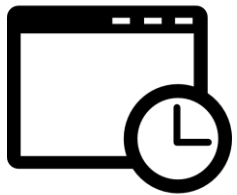
# Outcome Variables



New contributors joined



Existing contributors disengaged



Measure variables within observation time windows:  
1, 3, 6, 12 months



# Confounding Factors



- Presence of:  **CONTRIBUTING.md** Public
- Project popularity (#Stars)  **good first issue**
- Project age 
- ...

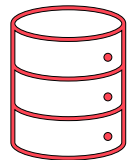


# Identify **Treatment** - **Control** Pairs



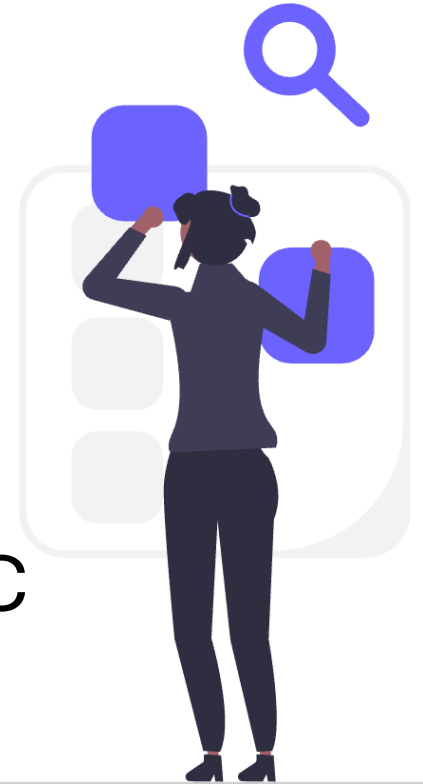
CoC

**Treatment Group:** Repos **adopted** CoC




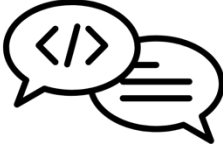


No CoC

**Control Group:** Repos did **NOT** adopt CoC



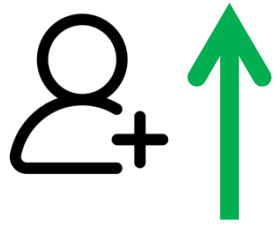
# Identify Treatment - Control Pairs

## 4 Matching Criteria

- Similar repo creation time 
- Same PL 
- Similar repo activity metrics 
- Similar recent contributor participation trend 

**Output:** 4,684 pairs of [   ]

# Findings for CoC Adoption Impact



New contributors  
(short & long-term impact)



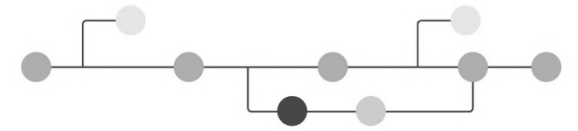
Disengagement  
(short-term impact)

- CoC likely serves as a visible signal
- Limited impact on long term retention



# Research Questions

- **RQ1 - How CoCs Evolve in OSS**
  - Update intention
  - Update pattern over time
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  - Update-engagement correlation



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CHAOSS

Richard Littauer  
Victoria University of  
Wellington

Shurui Zhou  
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## Abstract

While open source software (OSS) communities thrive on collaboration, conflicts such as toxic behavior and discrimination can surface, threatening project sustainability. To address these concerns, many communities have adopted a Code of Conduct (CoC) as a mechanism for governing and moderating members' behavior. Prior research has explored the motivations behind CoC adoption and their content updates, but it remains unclear how different communities are using and maintaining CoCs over time after initial adoption and how adoption impacts communities. To bridge these gaps, in our study, we compile a large-scale dataset of CoCs along with their change histories from GitHub to quantitatively (1) understand the evolution of CoC content and identify change patterns across different communities, and (2) investigate the potential impact of CoC adoption on community engagement. Our results show that OSS communities with a CoC attract more new contributors in both the short- and long-term. However, CoC adoption also leads to a short-term increase in disengagement among existing contributors, with very limited effects on long-term disengagement. The insights from this study can provide guidance for maintaining CoCs and offer statistically significant evidence of their impact.

## CCS Concepts

• Human-centered computing → Open source software; • General and reference → Empirical studies.

### ACM Reference Format:

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## 1 Introduction

With the growing popularity of social coding platforms like GitHub, more developers are now contributing to open source software (OSS) [14]. As communities grow, conflicts could emerge, such as toxic and discriminatory speech, entitlement, and aggression [51]. According to a survey conducted by GitHub in 2017, cumulatively

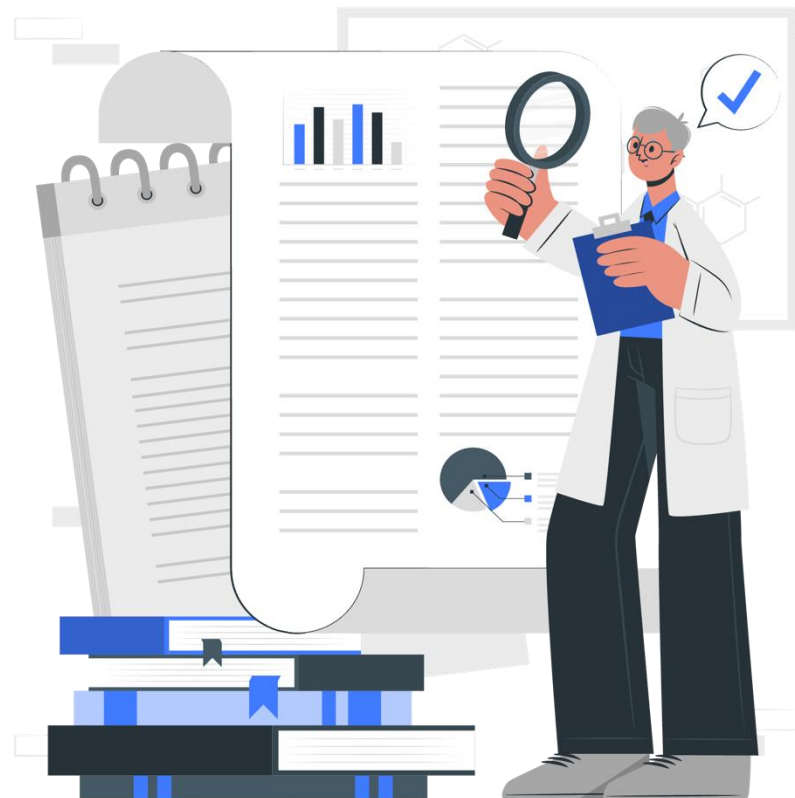
around 17% of contributors have experienced or witnessed serious incidents, such as sexual harassment, stalking, or doxxing [29]. Conflicts can result in an unhealthy community culture, developers abandoning projects, and an increased workload for already overworked maintainers, leading to a lack of sustainability for OSS projects [43]. Given the critical role of OSS in modern digital infrastructure, fostering welcoming communities could have a substantial impact on software development and the overall OSS ecosystem, which is crucial to global digital infrastructure.

To address conflicts, many OSS communities have adopted a Code of Conduct (CoC), a form of project governance. It can “define community standards, signal a welcoming and inclusive project, and outline procedures for handling abuse” [30]. It typically specifies expected behaviors from community members and consequences for violations of the CoC. OSS communities either craft their own CoC, or adopt existing templates and modify them for their own use, such as the Contributor Covenant [23], a widely-used CoC template that outlines standards for respectful and inclusive behavior among contributors. Similar moderation practices, including the establishment of community guidelines and mechanisms for reporting violations, are found in other online communities like Reddit [5].

CoCs were originally adopted by projects to improve the psychological and social well-being of contributors, which is a critical part of intrinsic ethical values [55], and to improve the long-term sustainability of OSS communities [77]. Despite the effort of adopting CoCs to address conflict and foster healthy communities, there are still existing challenges with CoCs in OSS communities, such as a lack of enforcement, as most CoCs do not outline an effective way to ensure compliance of contributors [43]. Also, many contributors and maintainers are against adopting CoCs in their community [43], holding that the value of meritocracy should be prioritized over community culture. Many consider improving Equity, Diversity, and Inclusion (EDI) to be a liberal political ideology [15, 43, 67], which can be polarizing to some community members. At the same time, while some existing work shows no statistically significant change in community diversity with a CoC [62], some studies show otherwise [69].

Moreover, prior research has qualitatively explored the motivations behind CoC adoption [69], the elements shaping CoC content, and the challenges of enforcement [43, 77]. Researchers have also investigated the impact of CoC adoption, particularly on diversity, but findings remain inconclusive, with some reporting positive effects while others find no statistically significant changes [17, 62, 69]. Therefore, the effectiveness of CoCs remains an open question, and there is no large-scale statistical evidence on the impact of CoC

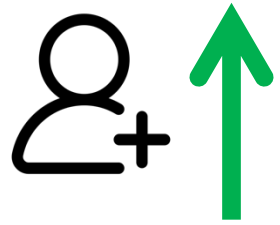
# More details in our paper!



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What do we learn  
from these findings?

# Findings for CoC Adoption Impact



New contributors  
(short & long-term impact)



Disengagement  
(short-term impact)

- CoC likely serves as a visible signal
- Limited impact on long term retention



# Anticipate the Governance Tension



## **Too permissive**

Marginalized contributors  
may feel unsafe

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## **Too permissive**

Marginalized contributors may feel unsafe

## **Too rigid**

Contributors who value autonomy may disengage

Approach CoC as an ongoing conversation with contributor feedback integrated

# CoC Impact Requires Continuous Evaluation

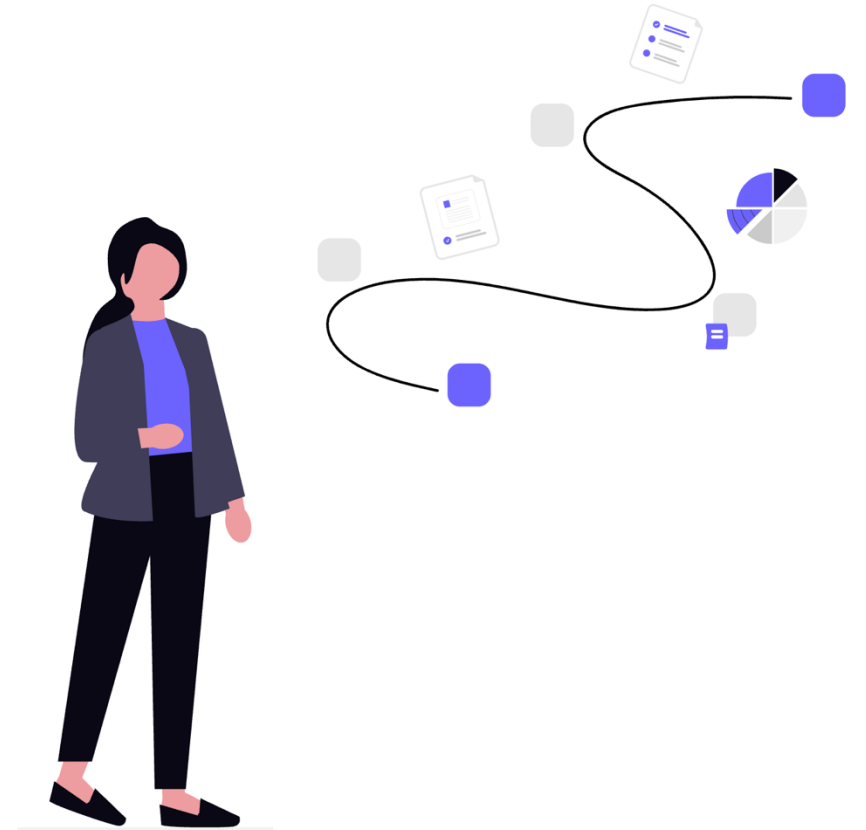
- From adoption → continuous monitoring
- For OSS practitioners, releasing **transparency reports** (i.e., incidents, resolutions, response time) helps internal **reflection** but also **signals** accountability externally.



# CoC Impact Requires Continuous Evaluation

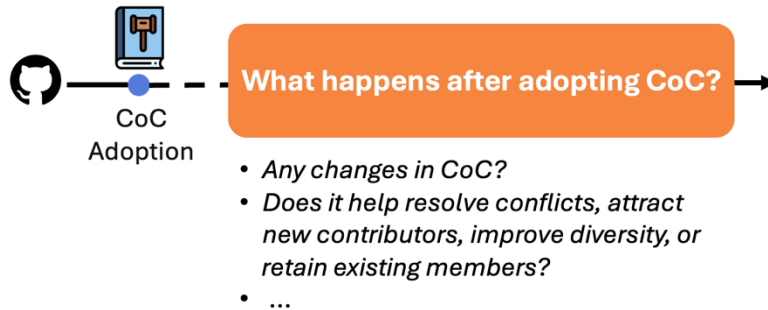
## For SE researchers:

- **Qualitative studies**  
Contributor perceptions  
of CoC impact
- **Enforcement effects**  
Impact on core vs.  
peripheral contributors



# Beyond Adoption: Examining the Evolution and Impact of Codes of Conduct on Open Source Communities

## From a Long-Term Perspective



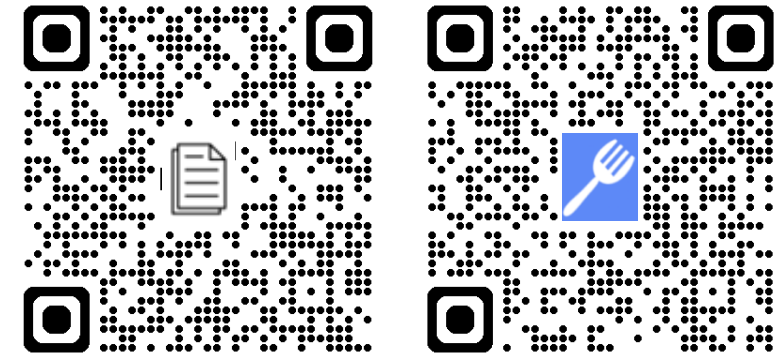
## Summary of Results

### • RQ1 - How CoCs **Evol**ve in OSS

- 11 change types (mainly non-content, availability, behavior, enforcement)
- Most repos: no updates · Few: sustained updates

### • RQ2 – **Impact** on Engagement

- **Adoption:** ↑ new contributors (short & long) · ↑ disengagement (short)
- **Updates:** weak (short) · some positive (mid) · small negative (long)



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