

# Developer's Years of Experience versus Code Quality: An Empirical Study

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- 1) Recap - MSc research
- 2) Systematic Literature Review and Results
- 3) Empirical Study

# Recap - MSc research

# Recap - MSc research

## Workana

workana Freelancers Jobs How it works Business Register Sign in Post a project

5 ★★★★★  
4+ ★★★★★  
3+ ★★★★★

Projects completed  
All 1 - 10 +10

Hourly rate  
USD 7 USD 40

Verified freelancers  
All Verified only

**J. P.**  
Full Stack Developer  
Singapore  
Hourly rate: **USD 25.00**  
Completed projects: 0  
Hours worked in hourly projects: 0

I'm an experienced software developer with over 6 years of experience in frontend && backend development, primarily using C# (ASP), Django (framework), Flutter, React Native, Angular, React, Node, PHP as my main weapons. I'm capable of developing Frontends && Backends for c ... [View more](#)

Django (3 to 5 years) React.js (3 to 5 years) PHP (3 to 5 years)

**Gabriel G.**  
Full Stack Developer  
Singapore  
Hourly rate: **USD 30.00**  
Completed projects: 7  
Hours worked in hourly projects: 0

Programming or scripting languages :  
- HTML5 for general web content  
- Javascript/Jquery/Bootstrap/AJAX for handling web events and dynamic web content  
- CSS for HTML element properties customization, i.e. customize look and feel  
- PHP and Wordpress environment for CMS. ... [View more](#)

WordPress (+10 years) PHP (+10 years) WooCommerce (+10 years) [View more](#)

# Recap - MSc research

## Cross-validation

### Workana

#### Skills

Skills	Certifications	Projects worked	Experience years
PHP		14 projects	1 year
MySQL		9 projects	1 year
HTML5		8 projects	1 year
WordPress		8 projects	1 year
JavaScript		7 projects	1 year
Bootstrap		1 project	1 year
E-commerce		1 project	1 year

### GitHub

The screenshot shows a GitHub repository page with a search bar at the top. Below the search bar, there are filters for 'Type', 'Language', and 'Sort'. A dropdown menu for 'Language' is open, showing options: All (checked), JavaScript, Vue, Python, C++, Dart, HTML, and Java. The main content area displays a list of repositories:

- Business-Management-System** (Public)  
Enterprise management system based on <https://github.com/thiagopena/djangoSIGE> with interface enhancements, new features and optimizations.  
JavaScript 1 star 5 forks Updated last month
- Institutional-Website** (Public)  
Institutional website for sales of mattresses and armchairs.  
Vue Updated on Jan 5
- Monty-Hall-Problem** (Public)  
Vue Updated on Jan 4
- Calculator** (Public)  
Calculator developed with Vue framework  
Vue Updated on Jan 4
- Domain-Generator** (Public)  
Project of a domain generator using Vue.js, GraphQL and Node

# Recap - MSc research

## From Workana to Github



K. M.

Software developer, building microservices

1 ★★★★★ Singapore

Hire

Completed projects: 0  
Hours worked in hourly projects: 0

Interested in taking on software development projects. Able to learn new languages and frameworks quickly to build products. Some of my projects can be seen here <https://github.com/Leekwanmeng>

JavaScript Python Java



Product Solutions Open Source Pricing

Search Sign in Sign up

Overview Repositories 15 Projects Packages Stars 1



Lee Kwan Meng  
Leekwanmeng

Follow

8 followers · 6 following

Singapore

Achievements



Beta Send feedback

Block or Report

Pinned

Public-Freakout Public

Unity Game by D-Dragon Studios

C# ☆1 📄1

NDSC2019 Public

National Data Science Challenge (NDSC) 2019 Attempt

Jupyter Notebook ☆1

GroceryStore Public

Online web store mockup. Built on Vue.js, Node.js and MySQL

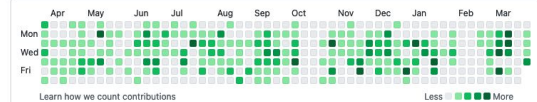
Vue ☆2 📄1

Image-Captioning Public

Pytorch model for image captioning task

Python

908 contributions in the last year



Learn how we count contributions

Less More

Activity overview



## Related works:

- Dieste et al. : there is little correlation between experience and external software quality. Research group: about 100 ppl
- Askar et al. : there is a positive correlation between student's experience and efficiency (external software quality). Research group: about 200 ppl

There are more works in the field, but with conflicting results.

What we will do differently:

- Explore a larger set of languages, not only Java;
- Automatic extraction of users, no surveys;



# Systematic Literature Review

Developer's experience is a key self-declared metric that we have available.

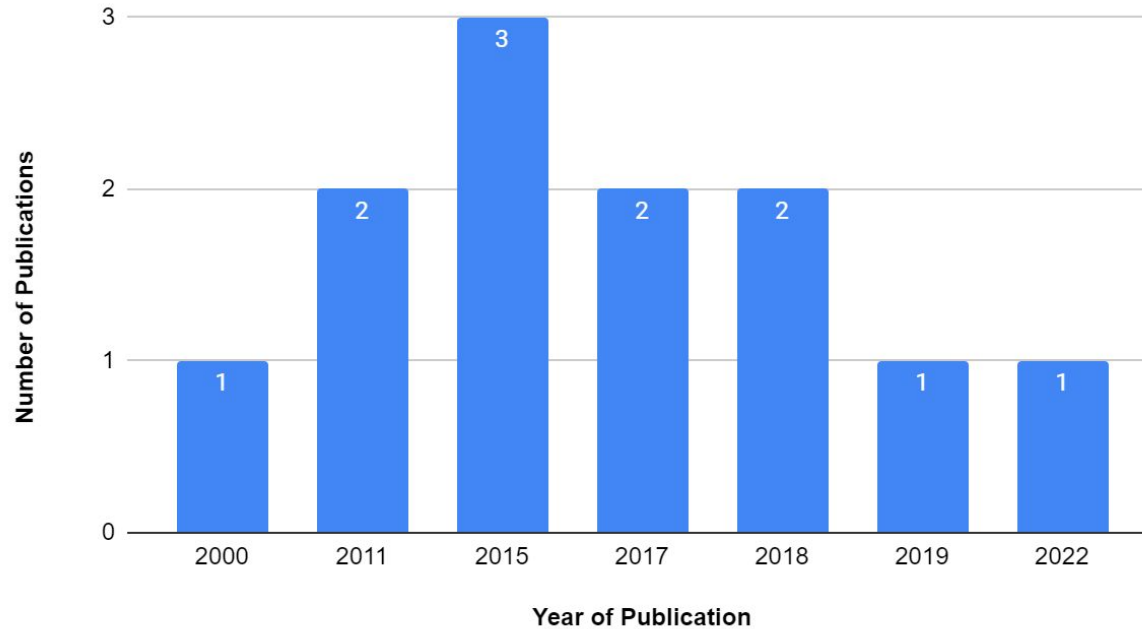
- What the literature defines as “experience” in this context?
- And what about quality?
- They can be related somehow? Or there's really no consensus?

In total, 12 studies met all the criteria:

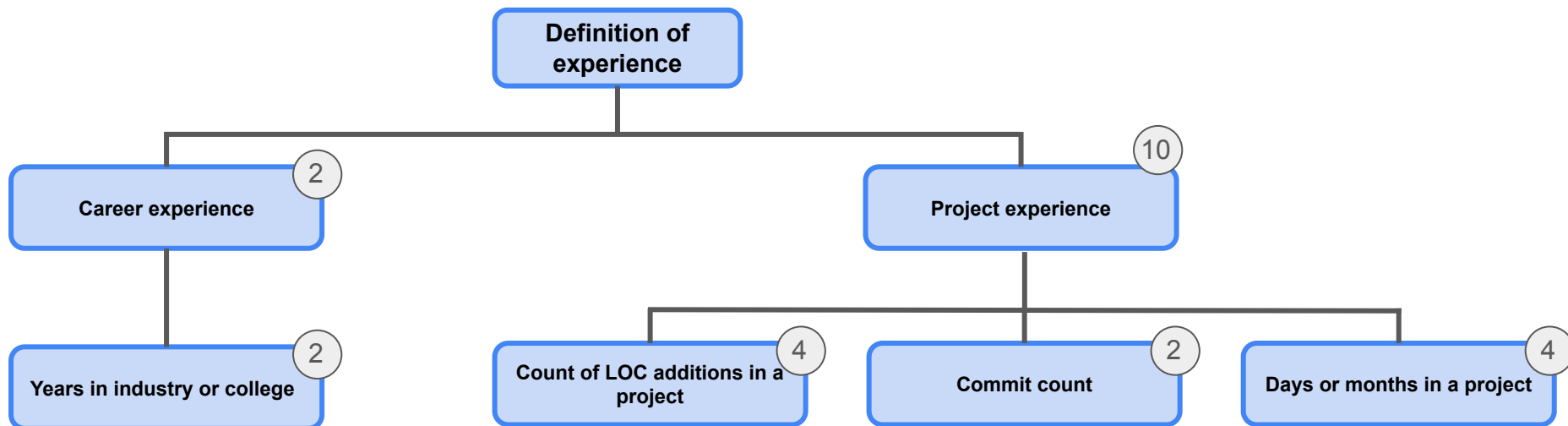
Some of them:

- Predicting Risk of Software Changes;
- An exploratory study on the influence of developers in technical debt;
- An Empirical Study of Developer Quality;
- Periodic Developer Metrics in Software Defect Prediction;
- Influence of Developer Factors on Code Quality
- .
- .
- .

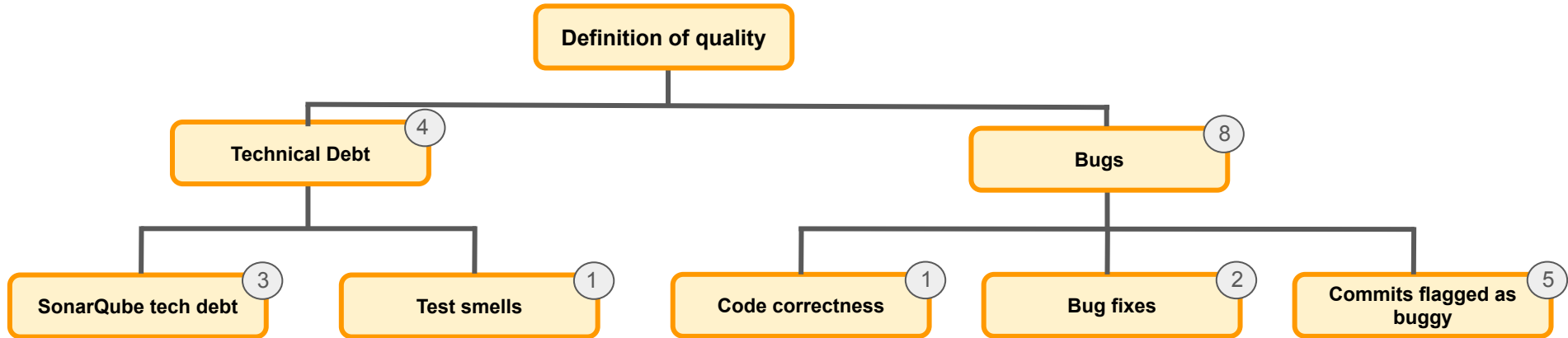
Number of Publications versus Year of Publication



RQ1: How the developer experience is evaluated?

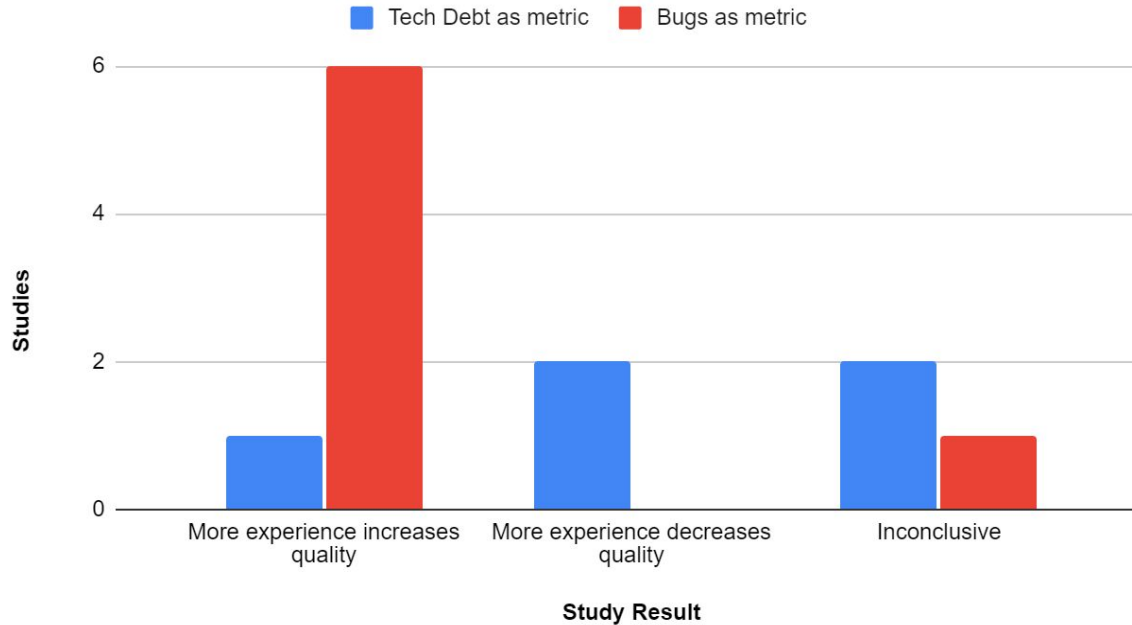


RQ2: How the software quality is evaluated?



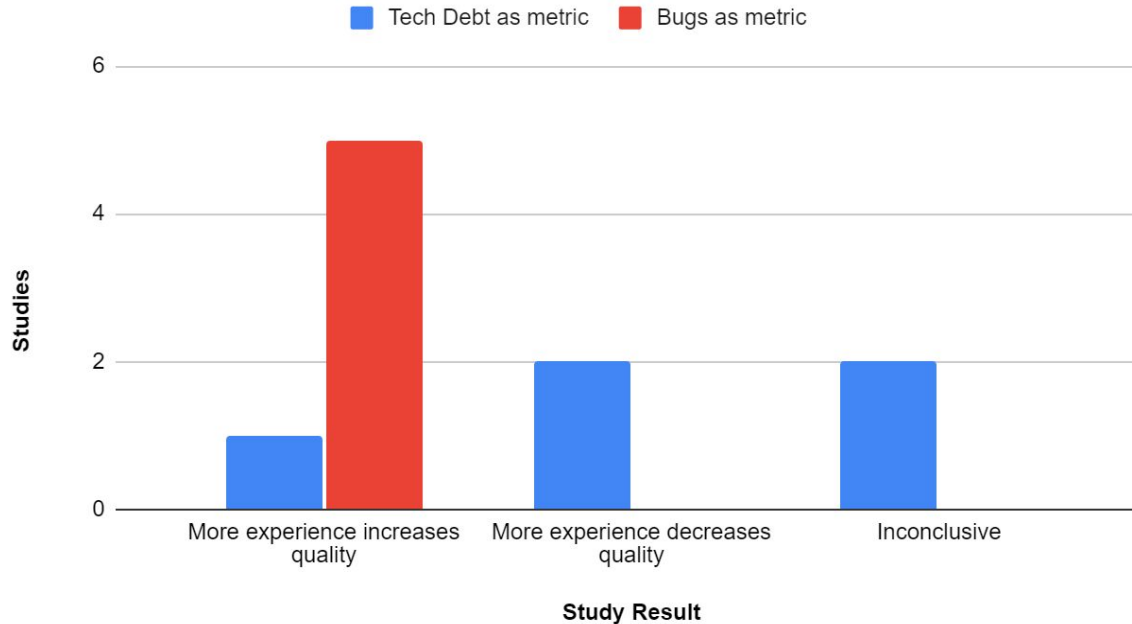
## RQ3: How the developer experience affects code quality?

### Overall Experience and Code Quality



## RQ3: How the developer experience affects code quality?

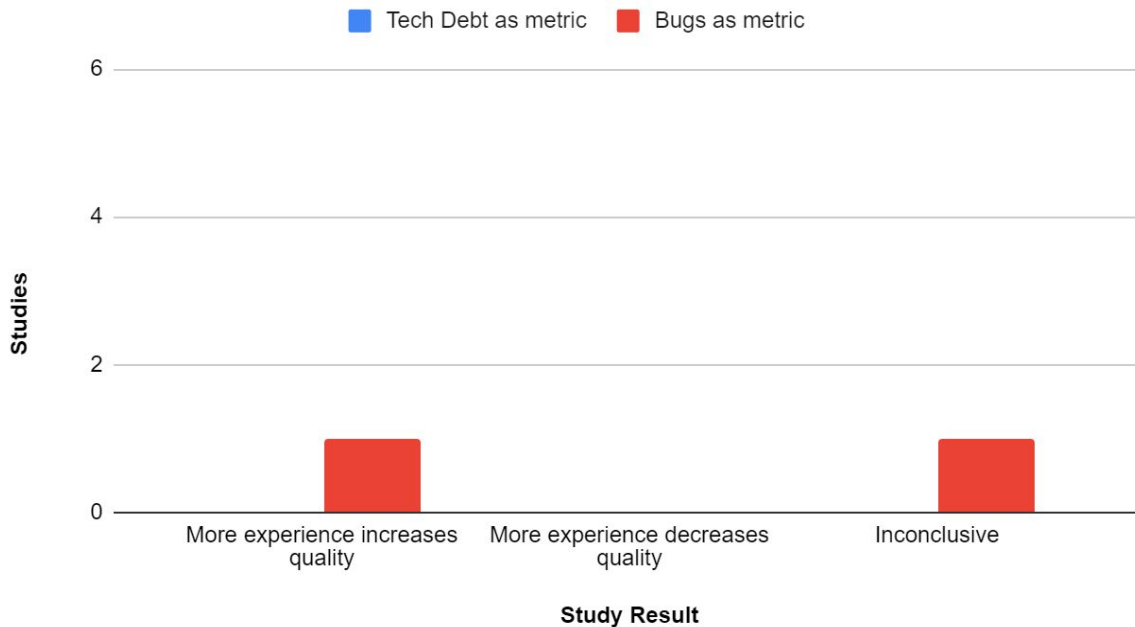
### Project Experience and Code Quality





## RQ3: How the developer experience affects code quality?

### Career Experience and Code Quality



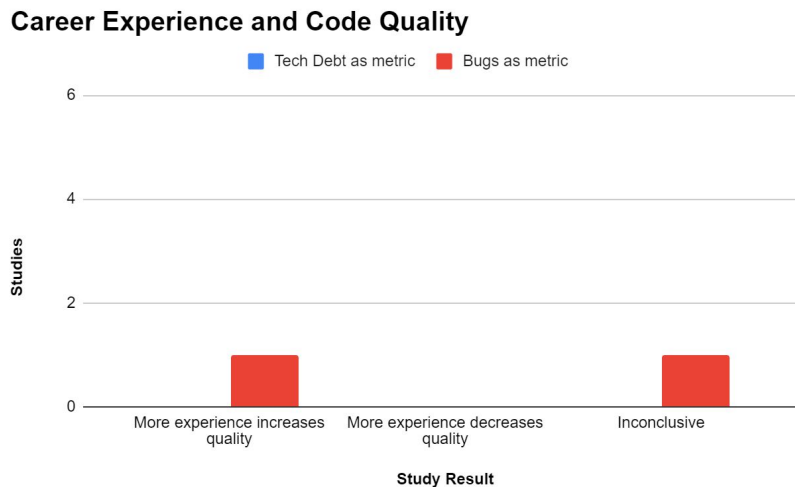
# Empirical Study

Study research questions:

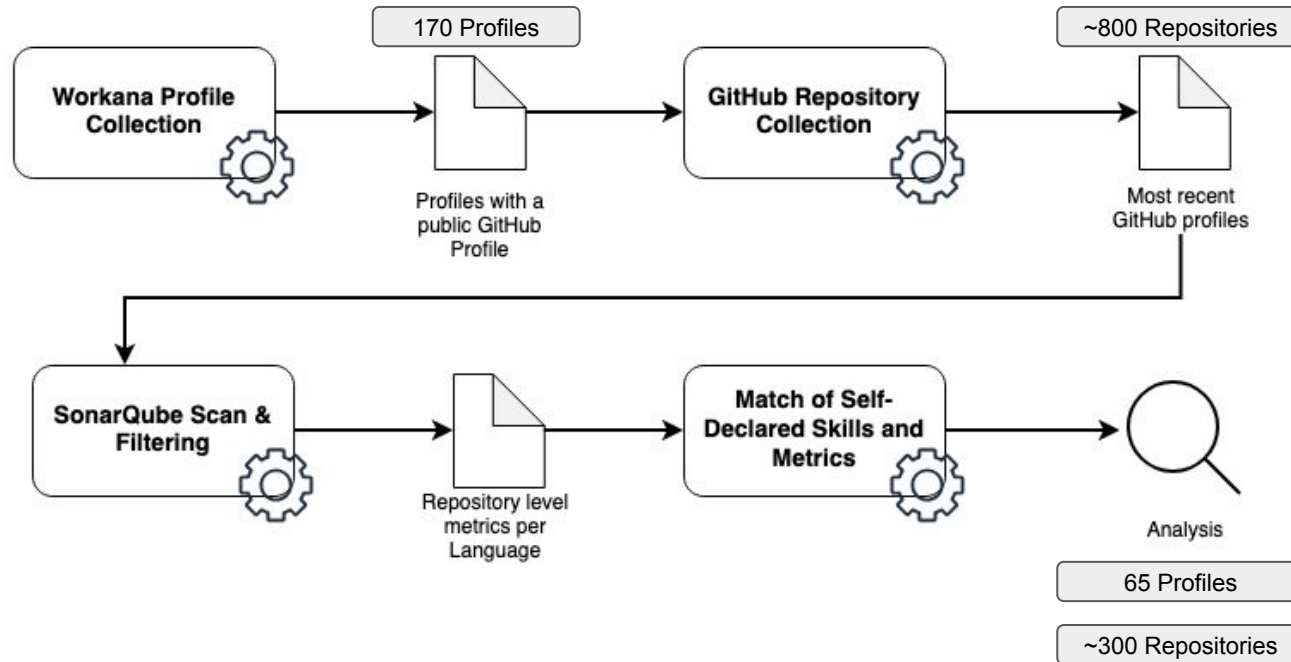
- RQ1: Is there a relationship between developer experience and code quality?
- RQ2: Is there a type of issue that is more common among developers with different levels of experience?

## Opportunities:

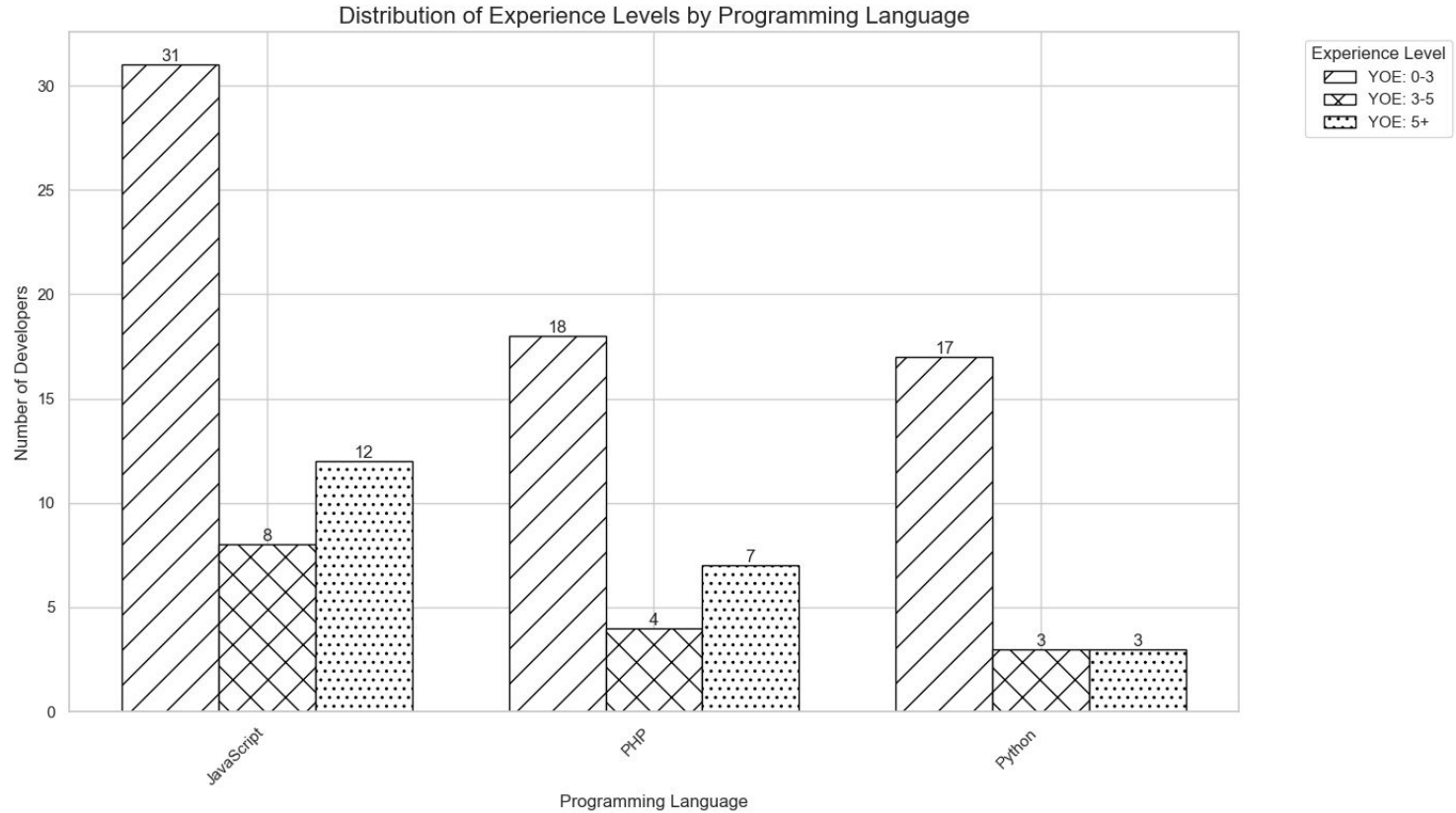
- There's a lack of studies tracking career experience and code quality after 1999;



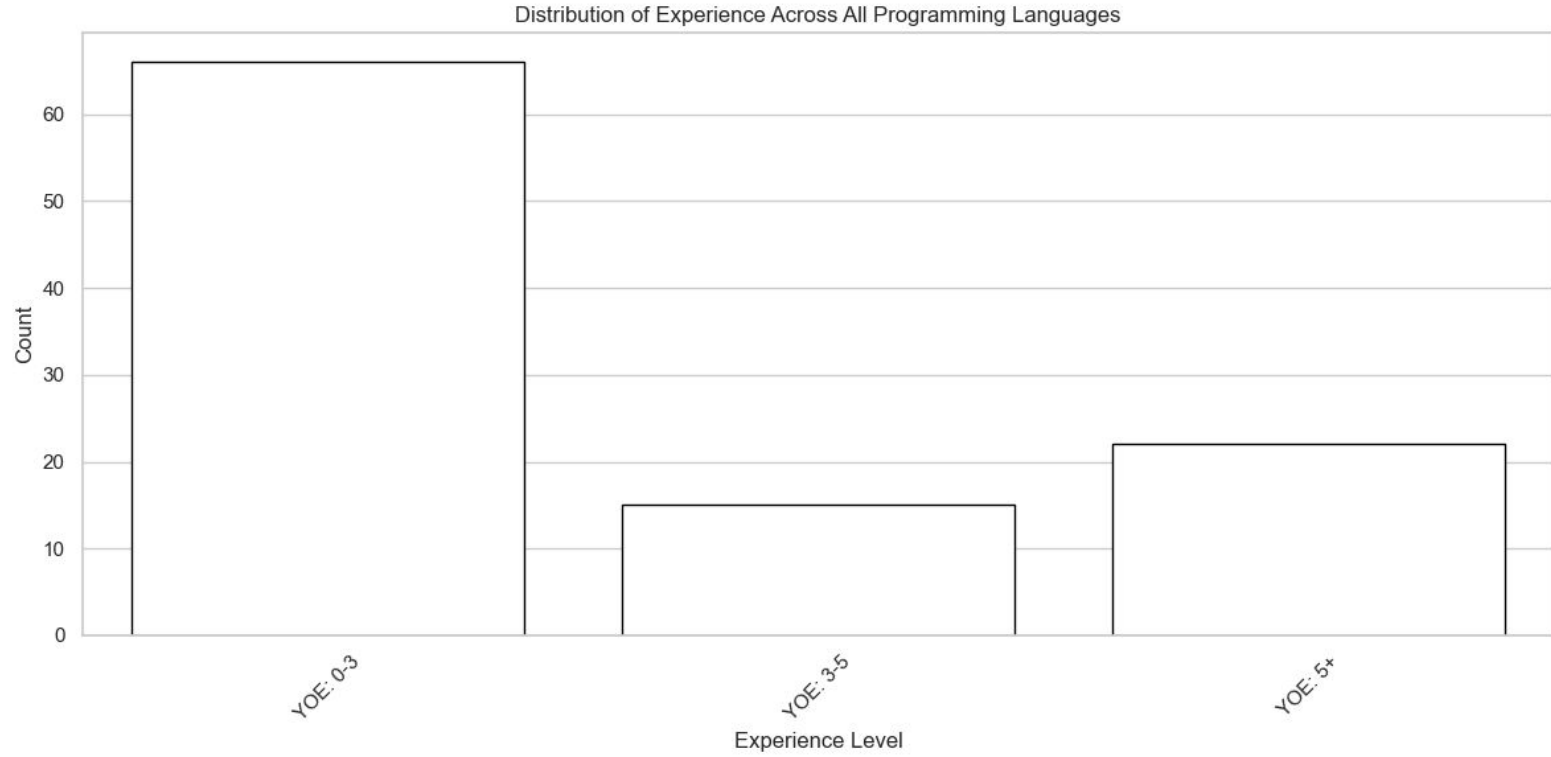
# Empirical Study



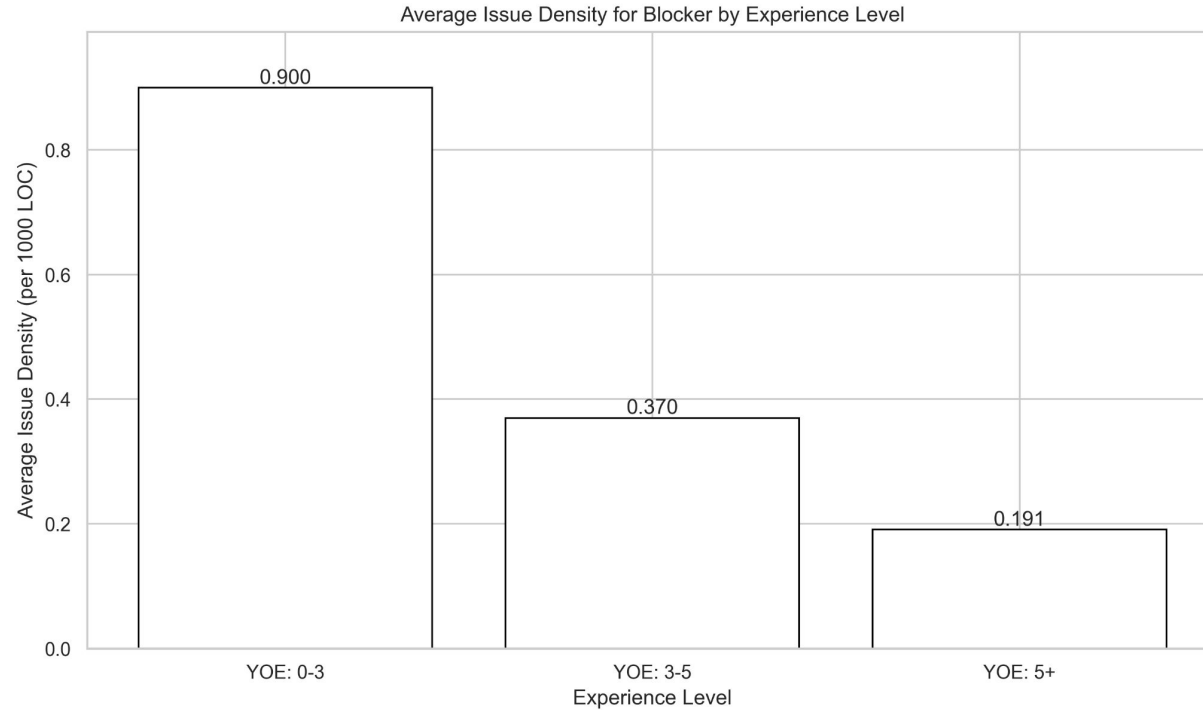
# Empirical Study



# Empirical Study



# Empirical Study



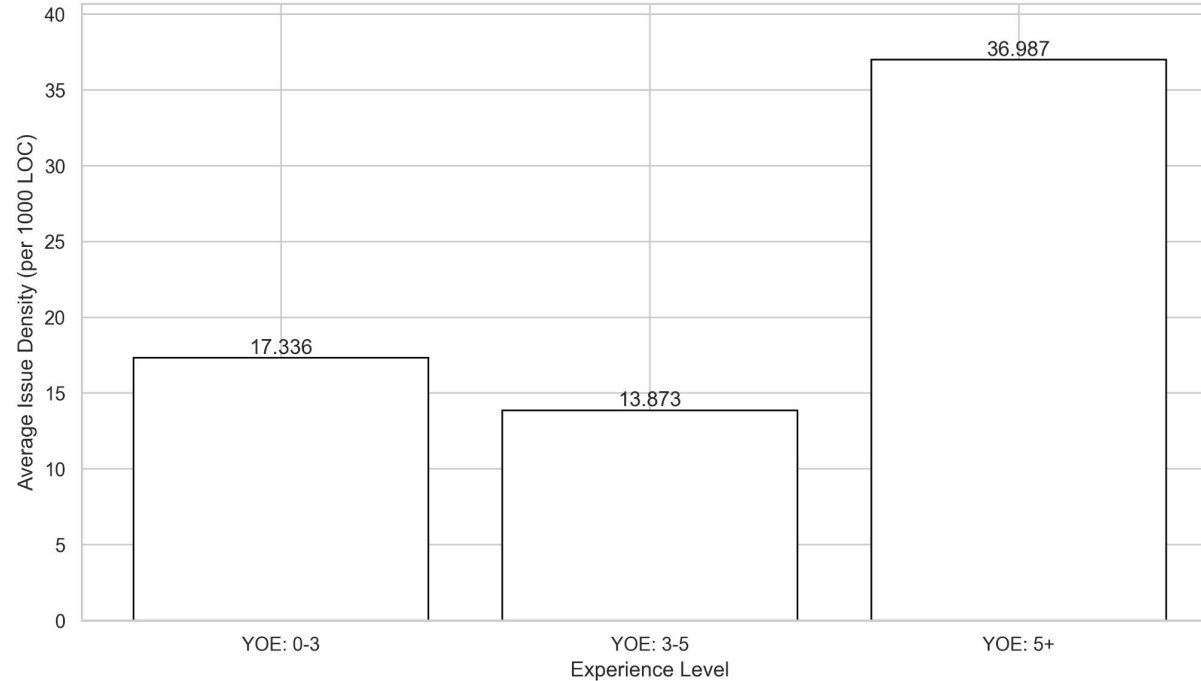
F-value: 4.602284  
p-value: 0.061451

**BLOCKER:** Bug with a high probability to impact the behavior of the application in production. For example, a memory leak, or an unclosed JDBC connection are BLOCKERS that *must be fixed immediately*.



# Empirical Study

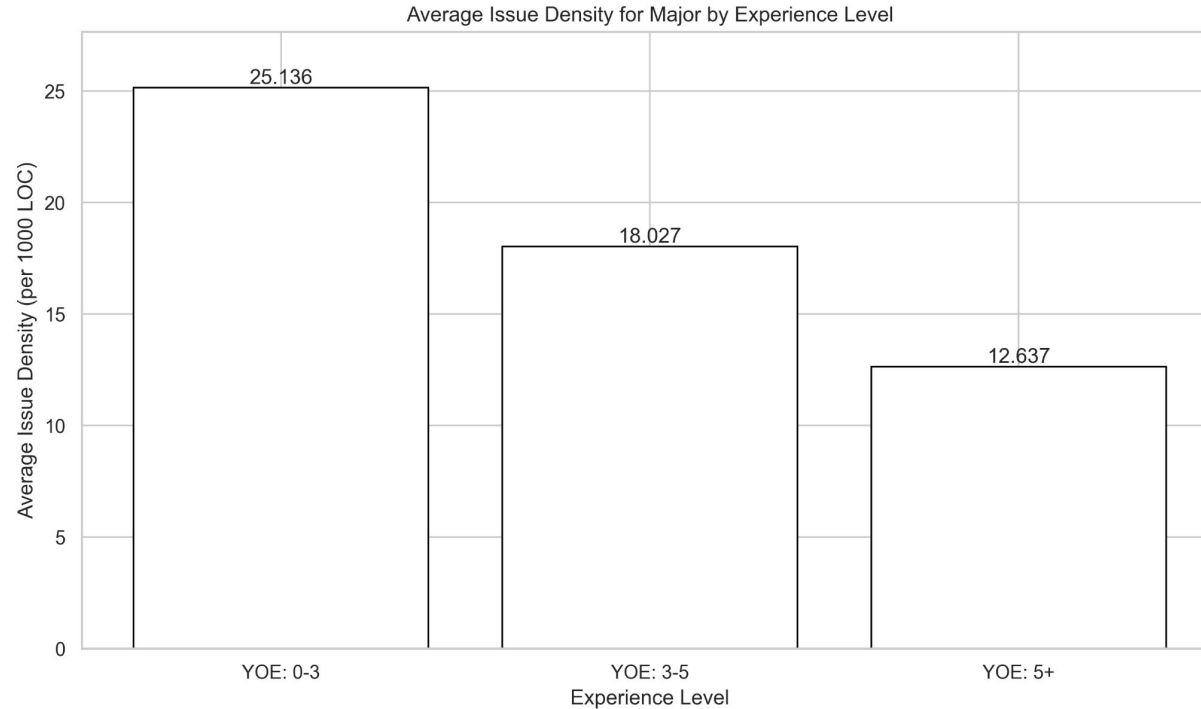
Average Issue Density for Critical by Experience Level



F-value: 0.494445  
p-value: 0.632746

**CRITICAL:** Either a bug with a low probability to impact the behavior of the application in production or an issue that represents a security flaw. An empty catch block or SQL injection would be a CRITICAL issue. The code *must be reviewed immediately*.

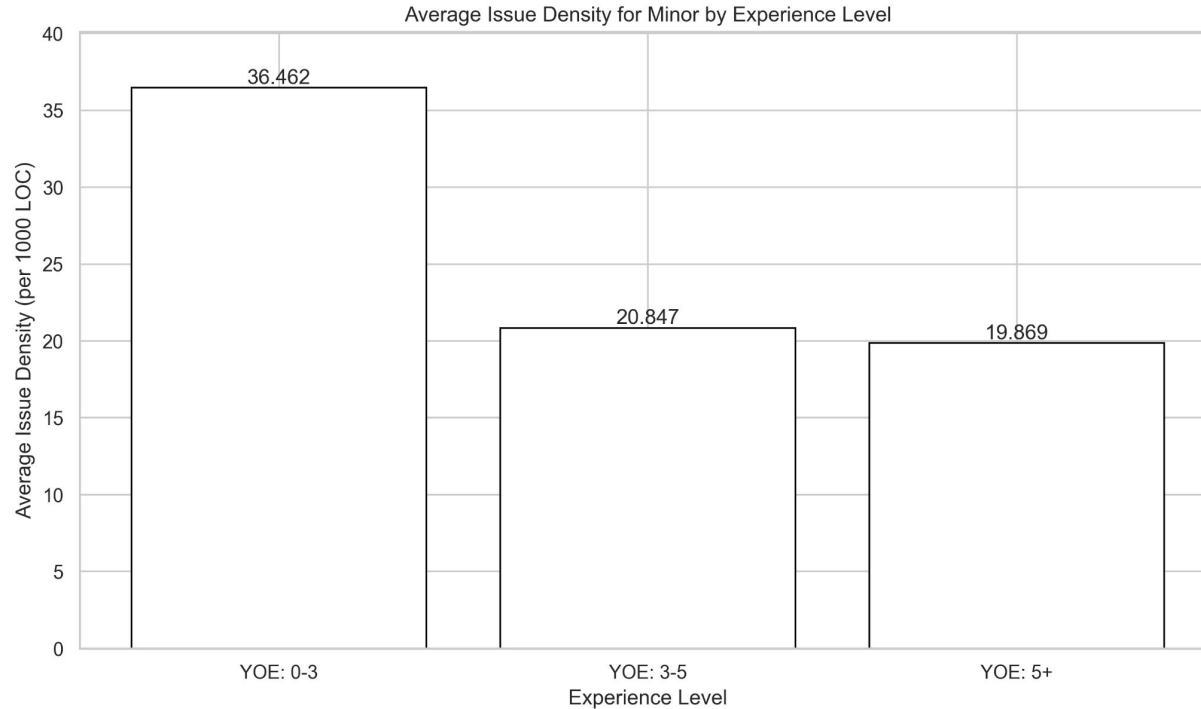
# Empirical Study



F-value: 4.036596  
p-value: 0.077495

**MAJOR:** A quality flaw that can highly impact the developer's productivity. An uncovered piece of code, duplicated blocks, or unused parameters are examples of MAJOR issues.

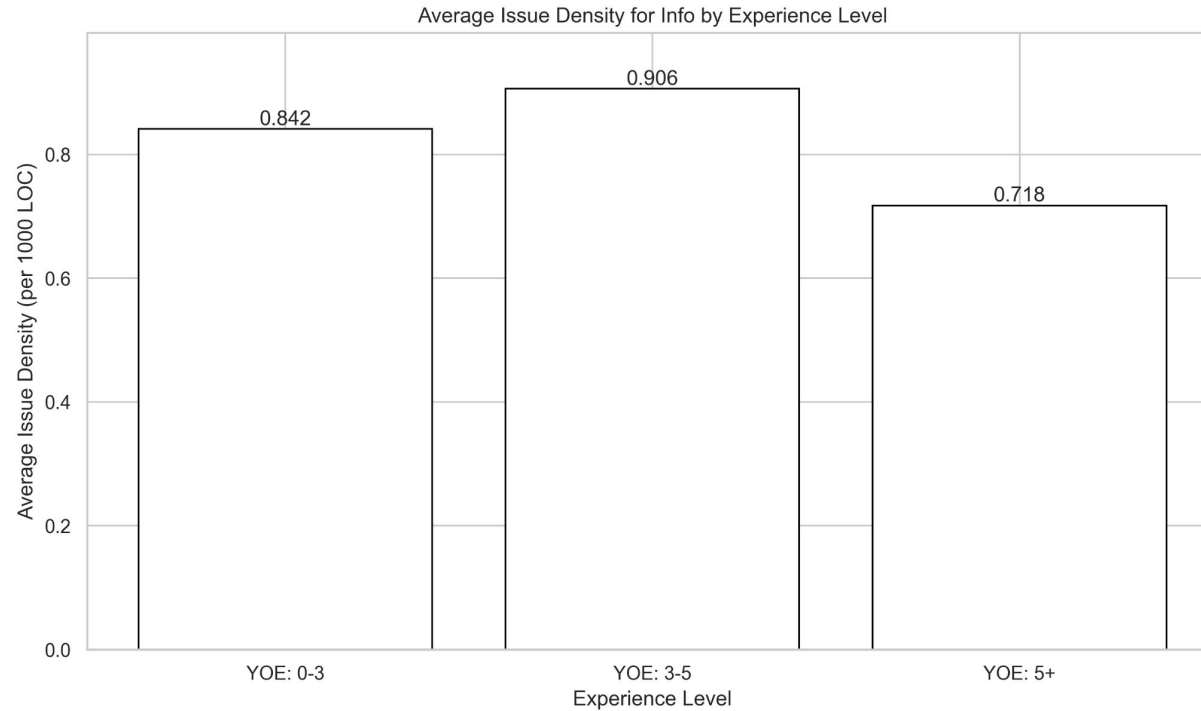
# Empirical Study



F-value: 0.567628  
p-value: 0.594600

**MINOR:** A quality flaw that can slightly impact the developer's productivity. For example, lines should not be too long, and "switch" statements should have at least 3 cases, are both be considered MINOR issues.

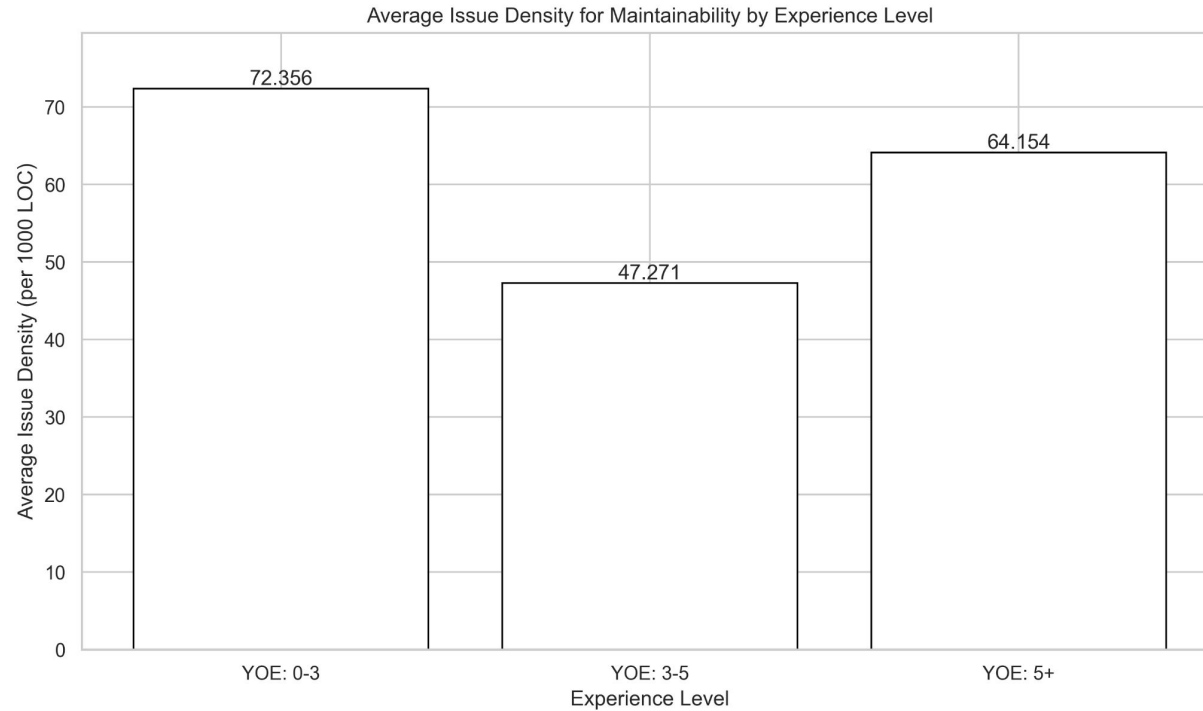
# Empirical Study



F-value: 0.030741  
p-value: 0.969878

**INFO:** Neither a bug nor a quality flaw, just a finding.

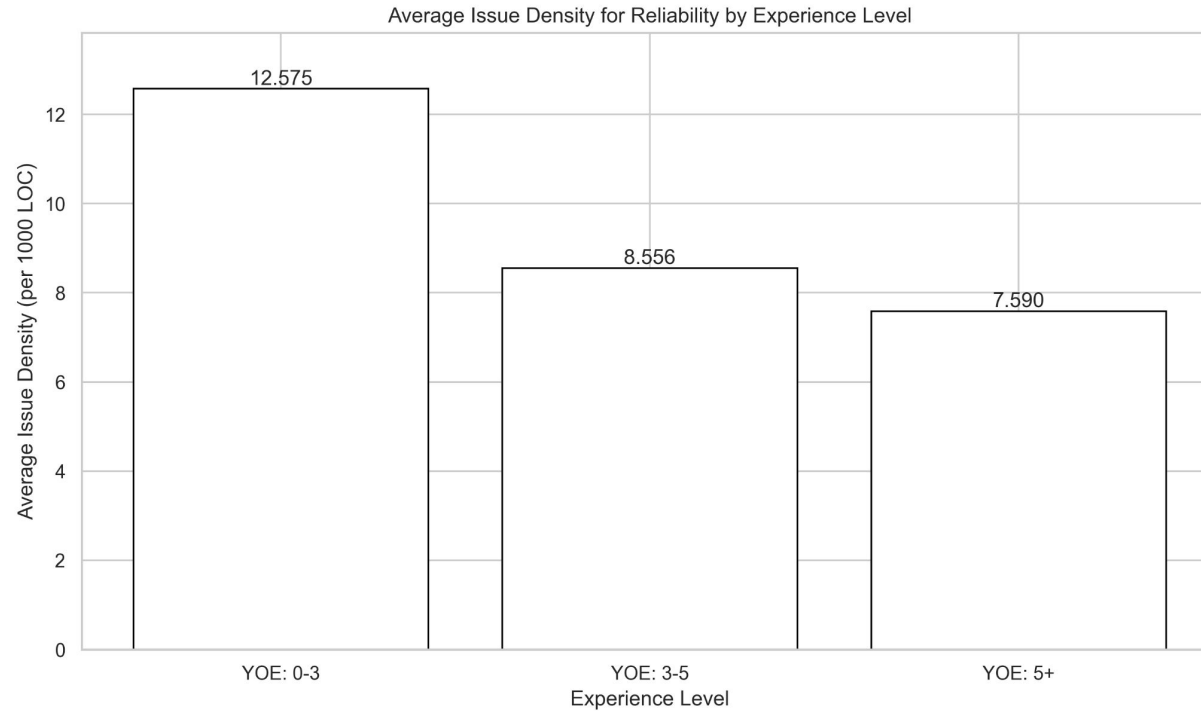
# Empirical Study



F-value: 0.413865  
p-value: 0.678617

**Code smell (maintainability domain)**

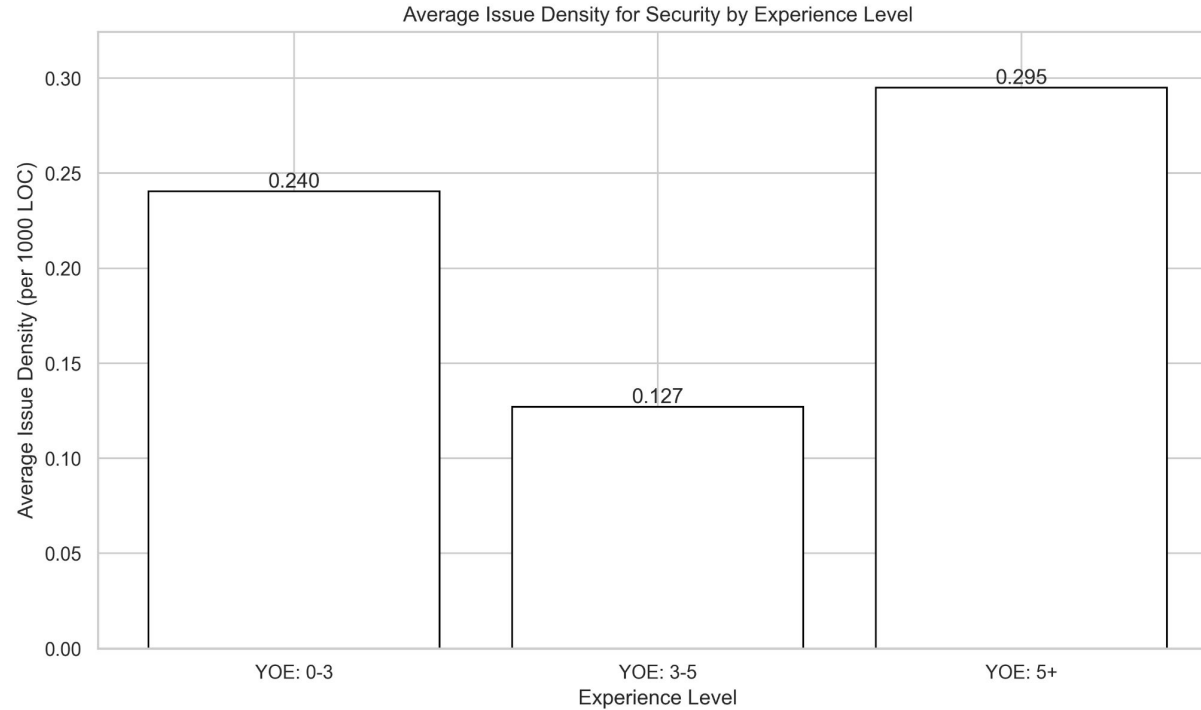
# Empirical Study



F-value: 0.278071  
p-value: 0.766494

**Bug (reliability domain)**

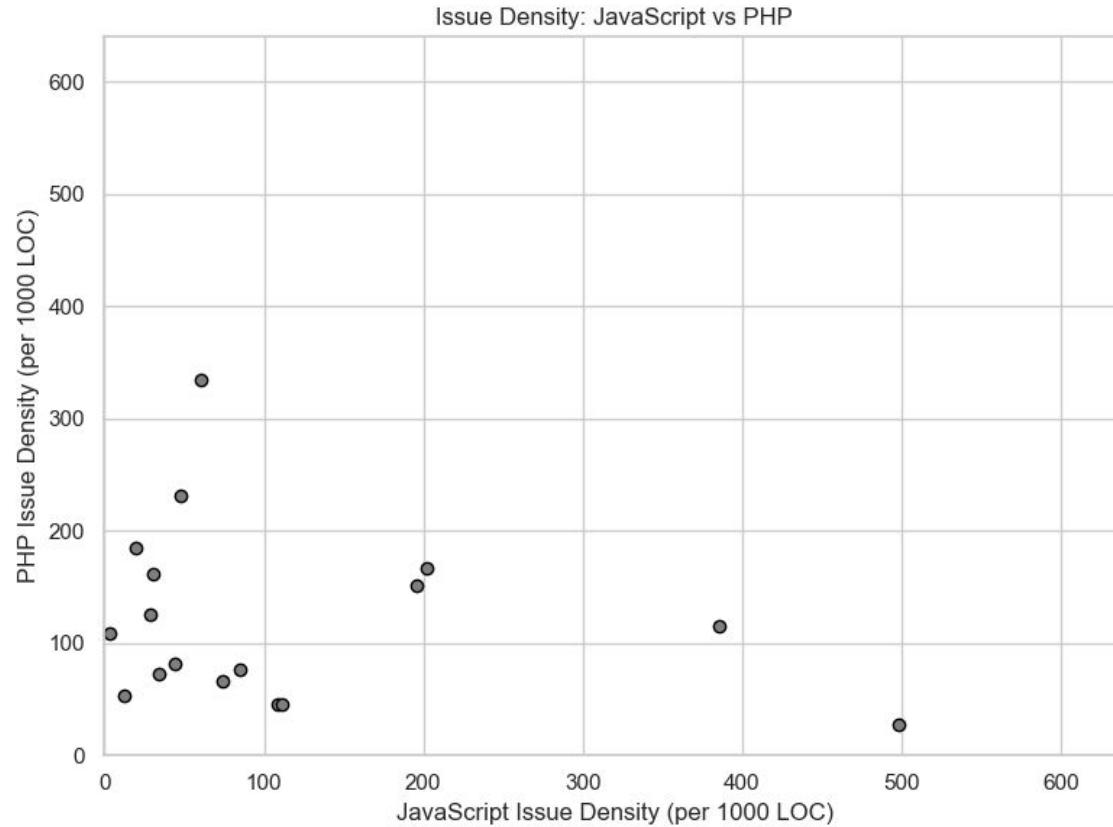
# Empirical Study



F-value: 0.091032  
p-value: 0.914225

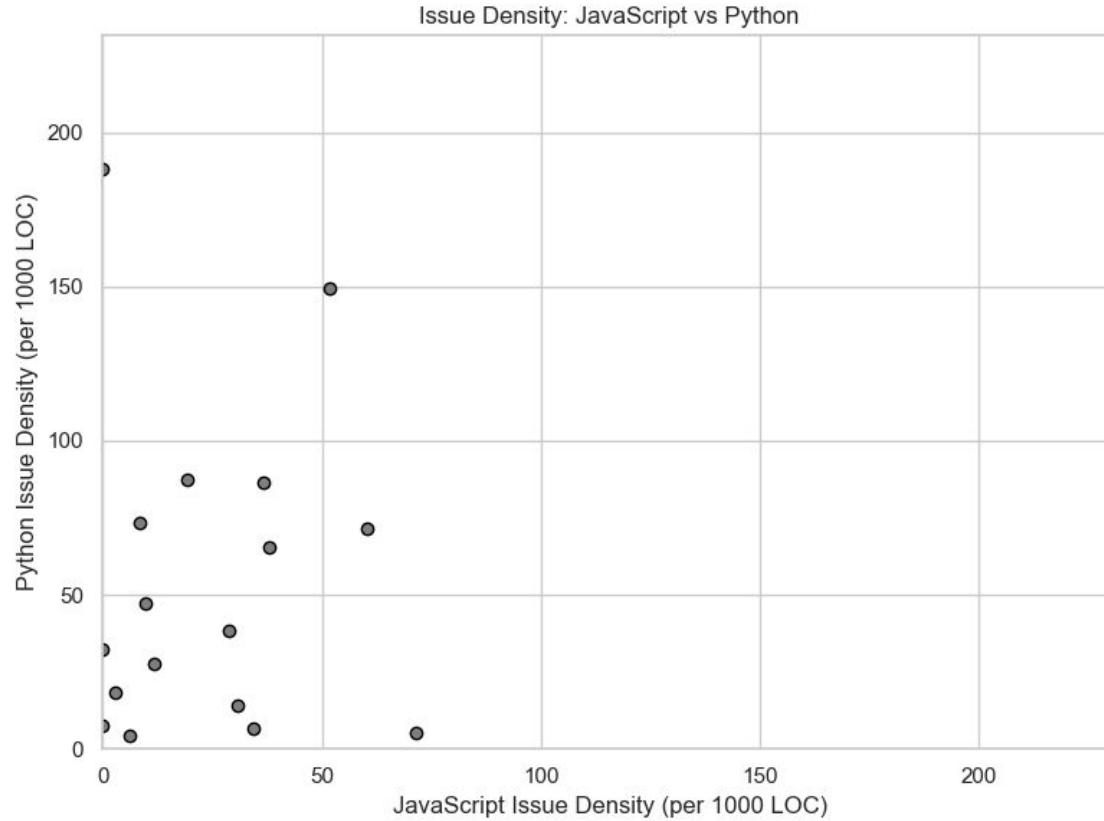
**Vulnerability (security domain)**

# Empirical Study

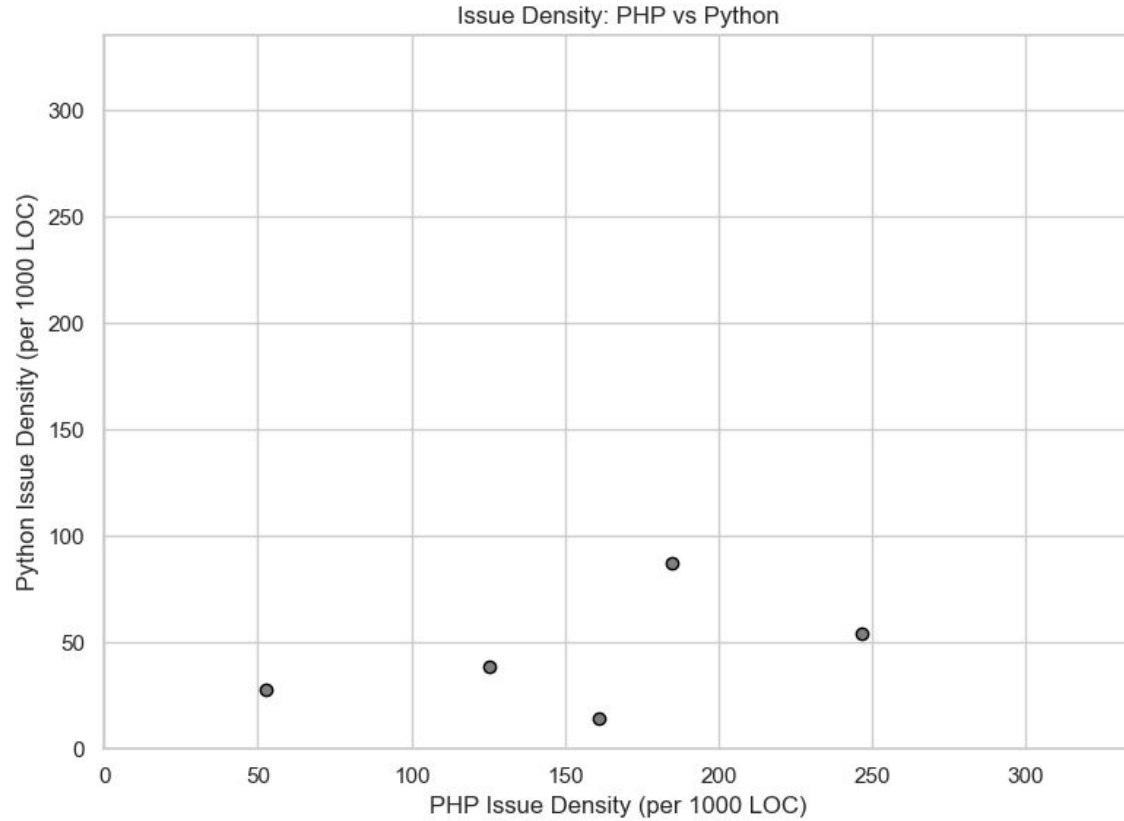




# Empirical Study



# Empirical Study



In summary:

- Some of the issue types are correlated with experience levels;
- Most of the issue types are not correlated;

The analysis is still being done, but:

- RQ1: Is there a relationship between developer experience and code quality?
  - Yes, for some types of issues;

Thank you

Any Questions?