How to Debug Inclusivity Bugs? A Debugging Process with Information Architecture
(Supplemental Materials)

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SUPPLEMENTAL INFORMATION: METHODOLOGY MATERIALS

<u>Facets Survey and Key</u>: Figure Supplemental-1 (spans multiple pages) shows the facets questionnaire and its key that was used to gather/pick participants for the Lab Study.

<u>Customized Abi Persona</u>: Figure Supplemental-2 is an example of an OSS newcomer Abi persona. The blue portions (background, age, occupation, etc.) are customizable.

<u>Empty Abi Persona</u>: Figure Supplemental-3 is an empty Abi persona form demonstrating (visually) how much of the persona can be customized. As the multiple photos in each persona emphasize, the personas can be customized to different ages/ethnicities/demographics.

<u>Original GenderMag Forms</u>: Figure Supplemental-4 (spans multiple pages) are the original version of the GenderMag forms.

<u>IA-supplemented GenderMag Forms</u>: Figure Supplemental-5 (spans multiple pages) are the specialized version of the GenderMag forms used during the study.

<u>System Usability Scale (SUS) Questionnaire</u>: Figure Supplemental-6 is a questionnaire given to participants after they completed all use-cases in the Lab Study.

<u>Use-cases for Lab Study</u>: Figure Supplemental-7 (spans multiple pages) the use-cases given to participants in the Lab Study.

<u>Fixes used in Lab Study</u>: Figure Supplemental-8, Figure Supplemental-9, Figure Supplemental-10, Figure Supplemental-11, Figure Supplemental-12, Figure Supplemental-13, are the before and after photos of the fixes implemented for Use-cases 1-4.

Re-usable customizable personas, analysis forms, and instructions for using them are available from http://gendermag.org/.

Actual human data cannot be released because unfortunately, our IRB does not permit releasing data on human participants. Even fully-anonymized data is not permitted.

Facets Survey and Key:

I am able to use unfamiliar technology when…	Disagree Completely			Neither Agree Nor Disagree				Agree Completely	
	1	2	3	4	5	6	7	8	9
1. I have just the built-in help for assistance.									
2. I have seen someone else using it before trying it myself.									
3. no one is around to help if I need it.									
4. someone else has helped me get started.									
5. someone shows me how to do it first.									
6. I have used similar technology before, to do the same task									
7. I have never used anything like it before.									
8. I am not confident about my ability to use and learn technology. I have other strengths.									
9. I make time to explore technology that is not critical to my job.									
10. One reason I spend time and money on technology is because it's a way for me to look good with peers.									
11. It's fun to try new technology that is not yet available to everyone, such as being a participant in beta programs to test unfinished technology.									
12. I enjoy finding the lesser-known features and capabilities of the devices and software I use.									
13. I explore areas of a new application or service before it is time for me to use it.									
14. I'm never satisfied with the default settings for my devices; I customize them in some way.									
15. I want to get things right the first time, so before I decide how to take action, I gather as much information as I can.									
16. I always do extensive research and comparison shopping before making important purchases.									
17. When a decision needs to be made, it is important to me to gather relevant details before deciding, in order to be sure of the direction we are heading.									
18. I avoid "advanced" buttons or sections in technology.									
19. I avoid activities that are dangerous or risky.									
20. Despite the risks, I use features in technology that haven't been proven to work.									

If agree on Questions….	
1, 2, 3, 4, 5, 6, 7	High Self Efficacy (Tim)
8	Low Self Efficacy (Abby)
9, 10, 11	Motivations: Technology for its own sake (Tim)
12, 13, 14	Learning: Tinkerer (Tim)
15, 16, 17	Comprehensive Information Processing (Abby)
18, 19	Risk Adverse (Abby)
20	NOT Risk Adverse (Tim)

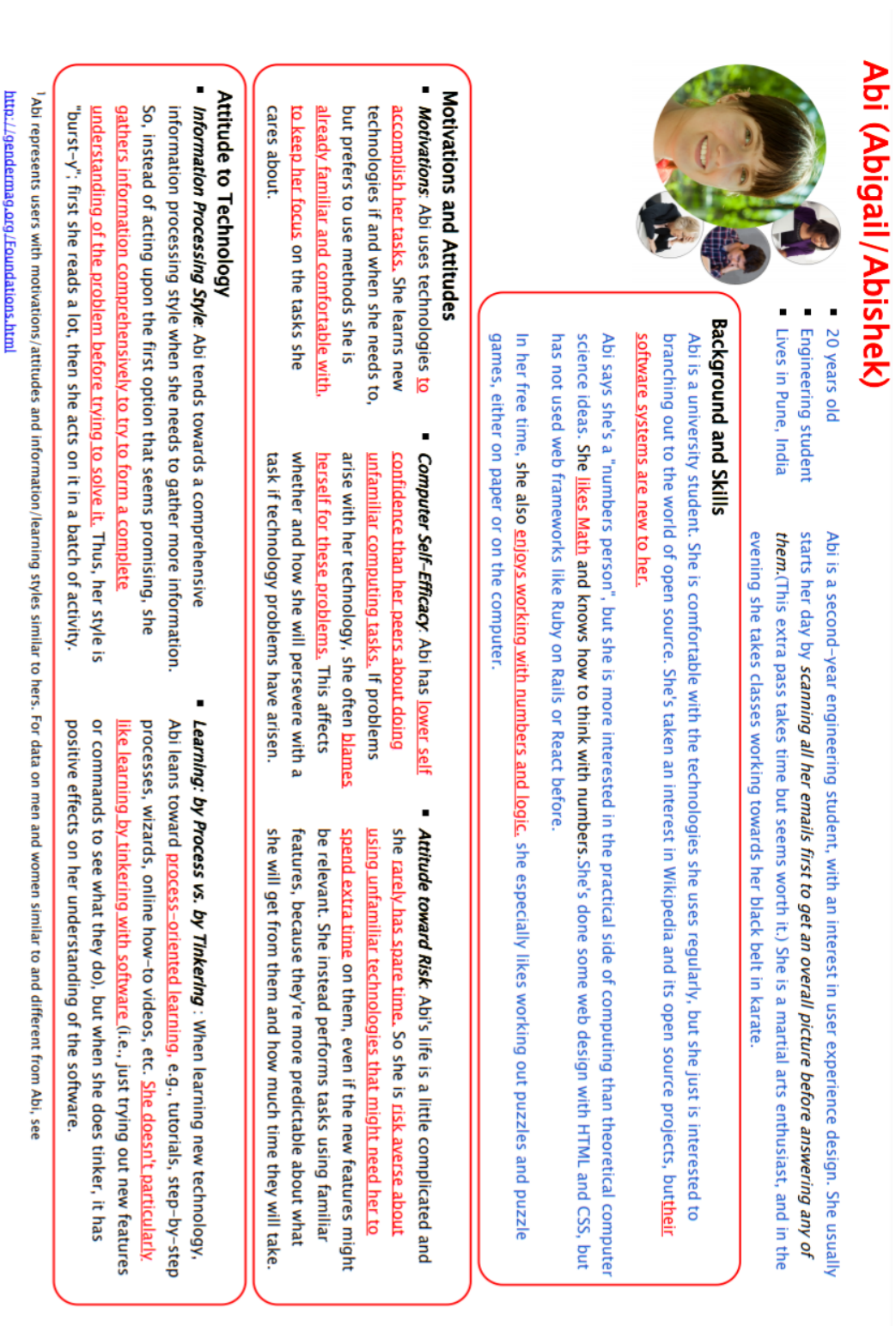Figure Supplemental-1: Facets survey used by some of the teams

Customized Abi:

Abi (Abigail/Abishek)

- 20 years old
- Engineering student
- Lives in Pune, India

Abi is a second-year engineering student, with an interest in user experience design. She usually starts her day by scanning all her emails first to get an overall picture before answering any of *them.* (This extra pass takes time but seems worth it.) She is a martial arts enthusiast, and in the evening she takes classes working towards her black belt in karate.

Background and Skills

Abi is a university student. She is comfortable with the technologies she uses regularly, but she just is interested to branching out to the world of open source. She's taken an interest in Wikipedia and its open source projects, but their software systems are new to her.

Abi says she's a "numbers person", but she is more interested in the practical side of computing than theoretical computer science ideas. She likes Math and knows how to think with numbers. She's done some web design with HTML and CSS, but has not used web frameworks like Ruby on Rails or React before.

In her free time, she also enjoys working with numbers and logic, she especially likes working out puzzles and puzzle games, either on paper or on the computer.

Motivations and Attitudes

- *Motivations:* Abi uses technologies to accomplish her tasks. She learns new technologies if and when she needs to, but prefers to use methods she is already familiar and comfortable with, to keep her focus on the tasks she cares about.

- *Computer Self-Efficacy:* Abi has lower self confidence than her peers about doing unfamiliar computing tasks. If problems arise with her technology, she often blames herself for these problems. This affects whether and how she will persevere with a task if technology problems have arisen.

- *Attitude toward Risk:* Abi's life is a little complicated and she rarely has spare time. So she is risk averse about using unfamiliar technologies that might need her to spend extra time on them, even if the new features might be relevant. She instead performs tasks using familiar features, because they're more predictable about what she will get from them and how much time they will take.

Attitude to Technology

- *Information Processing Style:* Abi tends towards a comprehensive information processing style when she needs to gather more information. So, instead of acting upon the first option that seems promising, she gathers information comprehensively to try to form a complete understanding of the problem before trying to solve it. Thus, her style is "burst-y"; first she reads a lot, then she acts on it in a batch of activity.

- *Learning: by Process vs. by Tinkering:* When learning new technology, Abi leans toward process-oriented learning, e.g., tutorials, step-by-step processes, wizards, online how-to videos, etc. She doesn't particularly like learning by tinkering with software (i.e., just trying out new features or commands to see what they do), but when she does tinker, it has positive effects on her understanding of the software.

[1] Abi represents users with motivations/attitudes and information/learning styles similar to hers. For data on men and women similar to and different from Abi, see http://gendermag.org/Foundations.html

Figure Supplemental-2: An example of a customized version of Abi.

Empty Abi Persona:

Abi (Abigail/Abishek)

scanning all her emails first to get an overall picture before answering any of them.

Background and Skills

their software systems are new to her.

"numbers person";

Math and knows how to think with numbers.

she also enjoys working with numbers and logic.

She likes

Motivations and Attitudes

- *Motivations.* Abi uses technologies to accomplish her tasks. She learns new technologies if and when she needs to, but prefers to use methods she is already familiar and comfortable with, to keep her focus on the tasks she cares about.

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Attitude to Technology

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[1] Abi represents users with motivations/attitudes and information/learning styles similar to hers. For data on men and women similar to and different from Abi, see

Figure Supplemental-3: Empty customizable Abi persona form used by teams to fill-in in preparation for a session.

Original GenderMag Forms:

Scenario (Overall Goal):_____

(e.g., Abby wants to find a science fiction book.)

Subgoal #___ : _____

1. Will <persona> have formed this sub-goal as a step to their overall goal?

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐None of the above
Why?	**Why?**	**Why?**

Action #__:_____

1a. [BEFORE ACTION] *Will <persona> know what to do at this step? Why?*

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. Tinkering ☐ None of the above
Why?	**Why?**	**Why?**

1b. [AFTER ACTION] If <persona> does the right thing, will s/he know that s/he did the right thing and is making progress toward their goal? Why?

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above
Why?	**Why?**	**Why?**

Figure Supplemental-4: The original version of the GenderMag forms.

IA-supplemented GenderMag Forms:

   Subgoal #_____

Scenario (Overall Goal): _____

(e.g., Abby wants to find a science fiction book.)

Subgoal #___: _____

1. *Will <persona> have formed this sub-goal as a step to their overall goal?*

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*	☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*	☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*
Why?	*Why?*	*Why?*

Action #___: _____

(e.g., Tap 'Browse Off'.)

      1a.   [BEFORE ACTION] *Will <persona> know what to do at this step? Why?*

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above	☐ Motivations ☐ Information Processing Style ☐ Computer Self-Efficacy ☐ Attitude Towards Risk ☐ Learning: by Process vs. by Tinkering ☐ None of the above
Why?	**Why?**	**Why?**
What in the UI helped/ confused <Persona> in this step?	**What in the UI helped/ confused <Persona> in this step?**	**What in the UI helped/ confused <Persona> in this step?**

1b. [AFTER ACTION] *If <persona> does the right thing, will s/he know that s/he did the right thing and is making progress toward their goal? Why?*

☐ Yes	☐ Maybe	☐ No
Which, if any, of <persona> facets did you use to answer the question?		
☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*	☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*	☐ *Motivations* ☐ *Information Processing Style* ☐ *Computer Self-Efficacy* ☐ *Attitude Towards Risk* ☐ *Learning: by Process vs. by Tinkering* ☐ *None of the above*
Why?	**Why?**	**Why?**
What in the UI helped/ confused <Persona> in this step?	**What in the UI helped/ confused <Persona> in this step?**	**What in the UI helped/ confused <Persona> in this step?**

Figure Supplemental-5: The forms that were used in the GenderMag sessions for this study.

SUS Questionnaire:

First and Last Name

[   ]

For each of the following statements, mark <u>one</u> box that best describes your reactions to the project today

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I think that I would like to use this project frequently	○	○	○	○	○
I found the project unnecessarily complex	○	○	○	○	○
I thought the project was easy to contribute to	○	○	○	○	○
I think that I would need the support of a technical person to be able to contribute to this project	○	○	○	○	○
I would imagine that most people would learn to contribute to this project very quickly	○	○	○	○	○
I found the project very cumbersome to contribute to	○	○	○	○	○
I felt very confident contributing to this project	○	○	○	○	○
I needed to learn a lot of things before I could get going with this project	○	○	○	○	○

Describe your overall experience in a sentence or two

[   ]

Figure Supplemental-6: SUS questionnaire used after each user study.

Use-cases for Lab Study:

_____

Context:
You decided that you wanted to start exploring the world of open source.
One of your friends told you about a project called ██████████ that they have been contributing to. You decide to check out the project…

_____

_____

Use-case 1-a: Familiarize yourself with the project and then find an issue that you are comfortable fixing.

_____

_____

Use-case 1-b: Add a comment to the issue explaining where/ how you would fix the issue.

_____

_____

Use-case 1-b (continued): Otherwise, if you are not sure how and where to fix that issue, add a comment asking for more details about that issue.

_____

_____

Use-case 2: Next, add the following text to the end of the first paragraph in the readme.
Make a merge request.

"If you want to use ██████████████████████ create an account and check the projects available. You may also want to add a project to our portfolio. Contact us for help!"
_____

_____

Use-case 3: Did you run into any problems while submitting a merge
request? If so, file an issue to report that problem.

_____

_____

Use-case 3(continued): if not, file an issue asking to provide more details on the process of making a merge request.

_____

_____

Use-case 4: Suppose you want to start contributing to this project on a regular basis. Find the instructions on how to set up
the environment on your machine and follow those instructions.

_____

_____

Figure Supplemental-7: The use-cases given to participants in the lab study.

Fixes used in Lab Study:

Before:

Want to help?

Want to contribute and not sure how to start? Please read the Contribute.md

We are happy to welcome new contributors.

Code style

_____

After:

Want to help?

Want to contribute and not sure how to start?

Although this is a software project, we welcome contributions with *documentation* (README, Contribution files, for example), simples *typo fixes*, *new issue* reports and *feature requests*.

Please read the **contributing guidelines** to find more about creating issues, finding tasks, editing documentation, setting up the environment, contributing with code.

We are happy to welcome new contributors.

Find an issue

If you want to contribute fixing something that has already been reported, you should:

1. Take a look in our issue list
2. Look for labels to guide you (bug, documentation, good for newcomers, etc.)
3. Find something that fits your goals or is appropriate for you
4. Ask for more details or inform the commuinity that you are interested in working with the i

Figure Supplemental-8: The before and after for Bug 1.

Before:

After:

Figure Supplemental-9: The before and after for Bug 2.

Before:

Want to help?

Want to contribute and not sure how to start? Please read the Contribute.md

We are happy to welcome new contributors.

Code style

Help us with code

Hi! if you're willing to contribute with code to ▮▮▮▮▮ these are the simple setps you must foll estimated to take up to 30min.

Step 0 - OS

We're focusing here on the Linux operational system (Ubuntu, Mint and other distributions) . Steps

Step 1- Rails Dependencies dependencies

There are some core dependencies that must be installed for the framework *Ruby on Rails* in which

1.1 Adding Node.js and Yarn repositories

After:

Want to help?

Want to contribute and not sure how to start?

Although this is a software project, we welcome contributions with *documentation* (README, Contribution files, for example), simples *typo fixes*, *new issue* reports and *feature requests*.

Please read the **contributing guidelines** to find more about creating issues, finding tasks, editing documentation, setting up the environment, contributing with code.

We are happy to welcome new contributors.

Work on documentation

Another nice and easy way to start contributing to the project is by fixing issues or adding information to our documentation. To do so, you just need to

1. navigate to the desired file (in this project they are usually markdown -- .md -- files);
2. edit in the GitLab editor (clicking the "Edit" button in the top-right corner of the file content);
   - You will probably be requested to create a fork. Go ahead and do that (want to learn more about forks? It is a copy of the repository to your account. More? Click here)
3. edit the file and submit your merge request following the GitLab workflow (want to know more about the merge request workflow? Click here
4. your changes will be reviewed before going to production (and some changes may be required later)

Figure Supplemental-10: The before and after for Bug 3.

Before:

File an issue

- Did you find any problem while using ████████
- Do you have any great idea of new feature that would make ███████ nicer?

Don't keep it to yourself. Please let us know! Reporting issues and providing feature requests are on report in our GitLab repository (either bug report or feature request).

To do so, go to the list of issues in our GitLab page, create a ``New Issue'' and provide as much deta as requested by other members in the follow up comments.

_____

After:

File an issue

- Did you find any problem while using ████████ ?
- Do you have any great idea of new feature that would make ███████ nicer?

Don't keep it to yourself. Please let us know! Reporting issues and providing feature requests ar report in our GitLab repository (either bug report or feature request).

To do so:

1. go to the issue list in our GitLab page
2. create a "New Issue" (Green button in the top left) and
3. provide as much details as you can in your report.

Remember to stay tuned in your issue to provide more details as requested by other members i

Figure Supplemental-11: The before and after for Bug 4.

Before:

Want to help?

Want to contribute and not sure how to start? Please read the Contribute.md

We are happy to welcome new contributors.

Code style

Help us with code

Hi! if you're willing to contribute with code to ████████ these are the simple setps you must foll estimated to take up to 30min.

Step 0 - OS

We're focusing here on the Linux operational system (Ubuntu, Mint and other distributions) . Steps

Step 1- Rails Dependencies dependencies

There are some core dependencies that must be installed for the framework *Ruby on Rails* in which

1.1 Adding Node.js and Yarn repositories

After:

Want to help?

Want to contribute and not sure how to start?

Although this is a software project, we welcome contributions with *documentation* (README, Contribution files, for example), simples *typo fixes*, *new issue* reports and *feature requests*.

Please read the **contributing guidelines** to find more about creating issues, finding tasks, editing documentation, setting up the environment, contributing with code.

We are happy to welcome new contributors.

Help us with code

Hi! if you're willing to contribute with code to ██████ in addition to find a task to contribute to, you will need to **set up the project** the appropriate changes to the codebase.

We provide a simple set of steps you must follow to get your local machine ready for development. Choose your Operating System:

- Linux
- Mac
- Windows -- Not available (Want to help us? Fix the issue 149, creating a step-by-step for setting up ████████ in a Windows box)

Though easy and simple, these steps are estimated to take up to 30min.

After that, hands on! Make your changes locally...

Figure Supplemental-12: The before and after for Bug 5.

Before:

Help us with code

Hi! if you're willing to contribute with code to ▌▌▌▌▌ these are the simple setps you must foll estimated to take up to 30min.

Step 0 - OS

We're focusing here on the Linux operational system (Ubuntu, Mint and other distributions) . Steps

Step 1- Rails Dependencies dependencies

There are some core dependencies that must be installed for the framework *Ruby on Rails* in which

1.1 Adding Node.js and Yarn repositories

_____

After:

Help us with code

Hi! if you're willing to contribute with code to ▌▌▌▌▌ in addition to find a task to contribute to, you will need to **set up the project** the appropriate changes to the codebase.

We provide a simple set of steps you must follow to get your local machine ready for development. Choose your Operating System:

- Linux
- Mac
- Windows -- Not available (Want to help us? Fix the issue 149, creating a step-by-step for setting up ▌▌▌▌▌ in a Windows box)

Though easy and simple, these steps are estimated to take up to 30min.

After that, hands on! Make your changes locally...

Set up your workspace using a Mac

Step 0 - OS / libraries

We're focusing here on MacOS. Make sure that your MacOS is up-to-date, as well as your Xcode app (you can install it

All the steps below need to be executed in a **command line terminal**.

Step 1 - Install HomeBrew

Homebrew is an open source software package management system that simplifies the installation of software on mac

```
/usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
```

Figure Supplemental-13: The before and after for Bug 6.