Illustration if Coding Process - An Actionable Framework for Understanding and Improving Developer Experience

Michaela Greiler, Margaret-Anne Storey,and Abi Noda

Abstract—In this document, we present samples of the coding we did during the study of developer experience. This is supplemental material that belongs to the paper: "An Actionable Framework for Understanding and Improving Developer Experience".

Index Terms—developer experience, grounded theory, development practices, satisfaction, productivity.

✦

1 EXAMPLE AND ILLUSTRATION OF THE CODING PROCESS

To analyze interviews, we used an open coding approach where we coded the interviews in an inductive (bottom-up) way [1]. Interviews were conducted and coded by two or more authors over several iterative cycles. Interview recordings and transcriptions were continually revisited until our findings were saturated (that is, no new codes or insights emerged). We divided the transcripts of the participants into coherent units (sentences or paragraphs) and added **preliminary codes** that represented the key characteristics that each participant talked about. We later agreed on a set of **focused codes** that captured the most frequent and relevant factors of developer experience.

We then used *axial coding* as described by Charmaz to group the codes into **categories**. This was done using visual mapping tools in several iterative cycles with discussion among the authors. As we were coding, we wrote memos for the codes and categories, and noted relationships across codes. Tables 1 and 2 shows examples of the coding process for several transcripts and the resulting codes, categories and core categories (that aggregate categories in our code hierarchy).

Early in our analysis, we identified a number of emergent **core categories**: developer experience (DX) factors, importance characteristics of DX factors, barriers impeding development teams from improving their experience, strategies for improving experience, and coping mechanisms if barriers could not be removed. These five core categories are key components in the developer experience framework that emerged from our analysis. The framework is our main research outcome and it also helped us refine our preliminary research questions. The core categories and associated subcategories and codes will be described in more detail in the following sections.

REFERENCES

[1] K. Charmaz, *Constructing grounded theory: A practical guide through qualitative analysis*. Sage Publications, 2006.

• *Michaela Greiler is with University of Zurich, Switzerland, and DX USA.*
  E-mail: greiler@ifi.uzh.ch
• *Margaret-Anne Storey is with University of Victoria, Canada.*
  E-mail: mstorey@uvic.ca
• *Abi Noda is with DX, USA.*
  E-mail: a@abinoda.com

Transcript Unit: "the developer tools that people use [are affecting DX]. So, I work in the.net stack mostly, and the tooling is actually great. But there is a tool called ReSharper, which is like an add-on that companies have to pay for, which makes you a lot more productive. And other types of tools. So I think tooling and the development environment itself is another big piece of it." (P22)			
Preliminary Code: Developer tools influence productivity	**Focused Code:** Development environment	**Category:** Development and release	**Core Category:** DX Factor
Transcript Unit: "Like I understand why we had to do it [release at the deadline], but it's no fun when you're working on something and you're taking pride in what you're working on, and knowing that basically like it's broken, but there's not a whole lot I can actually do about it right now." (P17)			
Preliminary Code: Releasing low quality code negatively impacts DX	**Focused Code:** Codebase health	**Category:** Development and release	**Core Category:** DX Factor
Transcript Unit: "If I do have the option to implement and design things the way I want to, that's great, and it is fun. But if there are no checks and balances and the developer who's doing it is kind of off on their own and a cowboy or cowgirl, you can end up with a terrible code base. So that one is a little, it's gray, it's not black and white." (P23)			
Preliminary Code: Autonomy needed but not unbounded	**Focused Code:** Autonomy	**Category:** Developer flow and fulfillment	**Core Category:** DX Factor
Transcript Unit: "they [my colleagues] tried to implement something that was asking them to be done in an unrealistic timeline. So, they [the colleague] wanted to leave. They immediately found a reason to not be at the company anymore because they have done this enough times to know the difference between losing a battle and losing a war." (P11)			
Preliminary Code: Unrealistic deadline and pressure leads to leaving job.	**Focused Code:** Leaving job , Unrealistic timeline	**Category:** -, Product management	**Core Category:** Coping mechanisms, DX Factor
Transcript Unit: "I believe that the ultimate goal for every company is - and this is pretty sad - it's to make money. And everything that doesn't drive the KPIs up is unnecessary. And so I think it [whether you can change DX] totally depends on the company's KPI. And if you are in a product driven company, for example, code quality is not so high, until it actually affects production. And, if it affects production, then it affects the KPI of making more revenue. So, I think, as a developer you should educate how much influence for example, quality, refactoring, bug fixing and investing in your tooling, how much it can influence the KPIs for product or for the company." (P10)			
Preliminary Code: DX might not be visible in KPIs, educating to build awareness	**Focused Code:** Inability to quantify problems, Speaking up	**Category:** -, -	**Core Category:** Barrier, Strategy
Transcript Unit: "I got really cynical about my experience at [company name] and I started like going into work and just being like, whatever, like, I'm not going to care about these things anymore. Like come in and do my job and I'm going to do the best I can on the project I'm assigned to, but I'm not going to worry about these like things that other people are not worrying about." (P8)			
Preliminary Code: Negative developer experience leads to apathy	**Focused Code:** Reduced Engagement	**Category:** -	**Core Category:** Coping Mechanism
Transcript Unit: "It was more interesting and more rewarding for me to work on this as I progressed my knowledge about the industry and the use case and how this all works together from a technical standpoint. Yes, I could do the project from a technical standpoint, but it was frustrating in the beginning because I did not understand why things worked, how they work." (P9)			
Preliminary Code: Domain knowledge needed to increase DX, Fit between tasks and skills and knowledge	**Focused Code:** Challenging/stimulating work	**Category:** Developer fulfilment and flow	**Core Category:** DX Factor
Transcript Unit: "In my team, for example, other developers are a little bit shy and they kind of want to see tickets and just do the tickets and not think about other stuff. But I personally won't start doing the ticket if I think that it's wrong because I can try to see in the future and things I'll actually have to clean up after this and tell you the truth. I think it's actually appreciated" (P7)			
Preliminary Code: Which factors are important is personal, not everyone speaks up	**Focused Code:** Personal interest, Speaking up	**Category:** -	**Core Category:** Importance characteristic, Strategy
Transcript Unit: "If it's an important KPIs, an important factor in a company, you can spend the time working on it. Otherwise you need to do it outside of your normal work." (P10)			
Preliminary Code: improvement has to be a company priority, otherwise you need to work outside of work on it	**Focused Code:** Company Goal, Working overtime	**Category:** -	**Core Category:** Importance characteristic, Coping mechanism
Transcript Unit: "The organization structure required teams to be formed for [driving improvements]. It must be like on a project, which would require taking people from a team. Then, [improving the test infrastructure] would become a competing priority that they didn't have much measurable data." (P15)			
Preliminary Code: improvement efforts must be a priority/ measurable, to get human resources assigned	**Focused Code:** Inability to quantify problems, low prioritization	**Category:** -	**Core Category:** Barrier, Barrier

TABLE 1
Further illustration of the coding process

Transcript Unit: "I've been at companies where the junior folks don't even know what the delivery process is or they don't talk to product managers. They're just thinking at a very zoomed in level about just getting their day-to-day coding done. And I think as you gain years of experience, that's when things like delivery, and the other categories start coming in as you get senior." (P2)			
Preliminary Code: seniority shapes importance	**Focused Code:** Seniority	**Category:** -	**Core Category:** Importance Characteristic

Transcript Unit: "I just started putting my foot down and thankfully I have other people, like my manager and another team member and QA to back me up and say, yeah, we shouldn't start doing these tickets without, you know, whatever it is that's missing."(P18)			
Preliminary Code: Speaking up and support from management	**Focused Code:** Speaking up	**Category:** -	**Core Category:** Improvement strategy

Transcript Unit: "What I encourage developers all the time is to talk about things like that because not everybody sees every problem, especially if systems get bigger. Talk about them!" (P9)			
Preliminary Code: Encouraging others to speaking up	**Focused Code:** Speaking up	**Category:** -	**Core Category:** Improvement strategy

Transcript Unit: "I think we all really bonded over the fact that we were being undervalued and underappreciated, and that's sort of what kept us helping each other out was that we really had a common ground that we hated the company that we were at. I guess this is the best way to say it. Because most of the time when we talked, if we had to like go on a rant, we would just talk about how much we hate being there. And, I think, cause we all had that same feeling, we always want to talk." (P11)			
Preliminary Code: Bonding over negative DX	**Focused Code:** Validating negative experiences	**Category:** -	**Core Category:** Coping mechanism

Transcript Unit:"I mean, we're the team that tests the releases. So, this is completely our thing. So, our team's main mandate is to make releases risk-free or to reduce the risk in releases. It's our task to write tests, for example. Tests like the big tests that test things in different environments, with different setups, different plugins installed and everything. So that's one of our main mandates, and we can influence it. But it still feels very slow and hard to change because it's a big task for five people." (P4)			
Preliminary Code: the large scope of problem can make it difficult to improve	**Focused Code:** No viable solution	**Category:** -	**Core Category:** Barrier

Transcript Unit: "I think that they [linters] help a lot. And, when I bringing this up and suggesting them I see that consistent code quality is not something that some of my coworkers - not that they don't think it's important or they think that it shouldn't be there at all - but it's like, I guess, it's much further down on the list for them. So, I think that's one that I've experienced personally where everyone has a different place for all of these things." (P13)			
Preliminary Code: No agreement with proposed change	**Focused Code:** No viable solution	**Category:** -	**Core Category:** Barrier

Transcript Unit: "I would feel better about only doing reviews, if I knew that that was my job and I would get rewarded for doing reviews. If that's what my job is, that's what my job definition is then, sure, happy to do your reviews, but I am being measured mostly by my code contributions." (P14)			
Preliminary Code: No recognition for code reviews	**Focused Code:** Lack of incentive	**Category:** -	**Core Category:** Barrier

Transcript Unit: "You just deal with it. Everyone would like to fix it, but you need to have the time for that. And there needs to be priority. And, I think, you need to also pinpoint like, okay, we are that much slower because we need to spend 20 seconds for each test." (P10)			
Preliminary Code: no priority and need to quantify problems	**Focused Code:** Low prioritization, Inability to quantify problem.	**Category:** -	**Core Category:** Barrier, Barrier

Transcript Unit: "I started finding ways to improve our process or our systems. I felt that brought value to the business because it would save us from rolling back on releases and reducing any issues where we didn't realize what impact it will have when we added this new feature. That was work I started incorporating with what I was originally doing. [But] my job description was asking me to be a Java developer. Be a back end developer and do that work. And that's what I was doing. But then I started expanding to things that were getting out of scope, and I think that's kind of where I'm saying I'm not getting compensated for it because it wasn't really part of the description. And I wasn't being valued in a way where they thought, okay, he brings something to the team." (P11)			
Preliminary Code: No incentive for improvements, Improvements are out of scope	**Focused Code:** Lack of incentive, Lack of improvement expectation	**Category:** -	**Core Category:** Barrier, Barrier

Transcript Unit: "I guess I'm not entirely sure [how to improve this] because in this organization, I feel like the things that I'm having problems with that sort of lead to this unfortunate work experience are kind of big picture. And like trying to rework the work processes between two departments is a large ask. [...] And so I'm not entirely sure what I would need to see this through." (P13)			
Preliminary Code: Unclear how to improve the problems	**Focused Code:** No viable solution	**Category:** -	**Core Category:** Barrier

Transcript Unit: "I just don't think there is like the data there to make a compelling argument to help reprioritize. So it was just kind of how loud can you be about it?" (P15)			
Preliminary Code: No data to make a case for improvement, speaking-up as way to drive change	**Focused Code:** Inability to quantify, Speaking up	**Category:** -, -	**Core Category:** Barrier, Strategy

TABLE 2
Further illustration of the coding process