

Appendix A: Interview

Interview 1, Date: 9/17/2023

[STUDENT] So I guess I'll start off the interview by asking you to clarify what the problem is. The problem that I'm trying to fix here and what you want out of this.

[CLIENT] Right. So the problem is when sales reps are making their sales, their customers have many designs that they want us to print. To be cost effective for the customer, it makes sense to gang certain designs together on one sheet. That way, only one screen has to be used. So, the screen is the main cost factor. So it makes it cheaper to run one screen, 70 sheets for seven different designs, rather than seven screens for, you know, one design up many times, 10 sheets each. So we're trying to get as many designs as possible on one sheet, depending on how many quantities they need.

[STUDENT] All right. And how is it currently being solved? Like this, the thing, all the designs on that one sheet, one screen.

[CLIENT] So what we're currently doing is the sales reps are guessing the average size of a design. Like so they have a bunch of designs—so they have a three by three, a 10 by 10, whatever—and they'll say, okay, I have about two five by fives. And they go, and they have to like math it out in their head and go, I think I can fit three on a sheet. They're just guessing.

[STUDENT] And it's sales that is reporting the 'Oh, I have two five by fives', and that's how they're reporting it to you?

[CLIENT] So they write down the actual sizes, because we'll actually put it on the sheet. They just need to get an order in, like because they care about getting the sale done and getting the customer's money. And then leaving the actual sizing to the people who will size it and lay it out.

[STUDENT] Okay.

[CLIENT] And then we run into the issue of, hey, these sizes don't fit on the sheet.

[STUDENT] And you want a quick way for them to find out if the sizes they're ordering are going to fit on that sheet.

[CLIENT] Yeah, so they know what sizes need to be done. They know roughly what the sheet size is going to be. Like they have a good idea of, okay, I need just the normal sheet or whatever. You know, and so they just need to know these sizes will fit on the sheet.

[STUDENT] All right. And then with that, like, what do you want them to see? What do you want the end result to look like from this?

[CLIENT] So a “no”, it doesn't fit on the sheet. It won't really be definitive. Like, because usually you can fudge things around a little bit, like a human can fudge things around to actually get it to fit on the sheet. The more important answer is a yes, like yes, this will fit on the sheet. Versus a no, contact your closest artist.

[STUDENT] All right. So you want a yes, this will be able to fit on the sheet without any, like, manipulation.

[CLIENT] Yeah. So the input that they would put in is sheet size and then listing however many designs they want with the final quantities of each of those designs that they need. And the output would be like, yes, this will fit this many of each of these designs. This many sheets need to be run. Otherwise, no.

[STUDENT] And then obviously excess is preferred then too little.

[CLIENT] Yes if we over run something, not an issue, we can not under run something

[STUDENT] And do you want, like the specific layout that would work best?

[CLIENT] That would be ideal, that would be a secondary thing to add on to this whole thing. Like I think starting with a smaller bite size, like max it out at ten designs, you don't have to actually lay it out for them.

[STUDENT] Alright.

[CLIENT] But if you design it with the eventuality in mind, that would be a good way to do it.

[STUDENT] Okay, so it's just going to be the fitting on the sheet.

[CLIENT] Yeah so the first question is a yes no, but with a yes, you need to know the number of sheets and the number up of each design

[STUDENT] Okay, and this information do you want it to be transmitted somehow, like moved from sales to artist or is by word of mouth good enough?

[CLIENT] Word of mouth is good enough because they know how to take a screenshot. So lets say that the layout thing is working then they'll take a screenshot of it and send it to the artist and

be like, hey look: “this” (indicating screenshot), and the artist says ok. But the big problem is that sales quotes these things that don't actually fit.

[STUDENT] I think that's doable.

[CLIENT] That's totally doable, you got this. And assume all designs are rectangles

[STUDENT] Yeah, I was already planning to do that, it makes the math a lot easier

[CLIENT] And if needed we can fit the sheet sizes to three given sizes or you just write it as a flexible sizing that they manually input.

[STUDENT] What is the range of sheet sizes you have? Is it like three, or is it like twenty?

[CLIENT] So there are three sheet sizes, but we need to leave room for registration in there so assume that we're subtracting an inch off of each of these dimensions. So we have a 13x19, an extension of that is 12x18, so I guess we have 4. A 28x40, and a 31x45.

[STUDENT] Then a drop down of the four different sizes is totally doable. It's a lot easier than manually inputting it every time. Then all the designs going on these sheets are going to be the same size, or is there going to be a variety of sizes?

[CLIENT] It'll be a variety of different sizes. The big problem is if they have things that are a lot of different sizes, like if it were all the same size you could think of it as one design, multiple “up”. But unfortunately were in a “ganging” situation.

[STUDENT] I'm trying to think if it would be better to make it so they have to put the number of designs they want to run and that many areas appear to enter information, or if I make an add new design button that will add a new one.

[CLIENT] Probably the button, and input the size and quantity needed

[STUDENT] And this quantity needed, it'd be total quantity.

[CLIENT] Yes, so minimum number of designs that have to be printed at the end. So if we had two up of a design, for fifty sheets, total quantity would be 100, so if we needed 80 we'd do that and have 20 excess. But the big problem is going to be how to slice up the sheet.

[STUDENT] And just so I have this now, there are going to be margins around each design, like quarter inch or half inch margin around each design?

[CLIENT] So standard cutting space is half an inch between designs.

[STUDENT] So a quarter inch margin for each design.

[CLIENT] Exactly, so with every design add that quarter inch on all sides, and then we can take that off of that inch margin around the sheet. So actually with the registration marks on the edges of the sheets, there's an interesting bit to this. So actually it's taking an inch off of both of these sides (indicates left and right sides) or these sides (indicates top and bottom).

[STUDENT] Interesting

[CLIENT] So you could essentially take it as, you have this sheet size that's a little bit longer, or this sheet size that's a little bit taller and run the program twice, and if either is a yes, then you go with that answer.

[STUDENT] Alright, well, thank you so much for letting me do this, I'm very excited.

[CLIENT] Of course, I'm really looking forward to not having to deal with sales misjudging sizes of designs and sheets. And feel free to ask if you have any more questions, I'll gladly answer them.

[STUDENT] Thank you, see you soon!

Interview 2, Date: 12/13/2023

[STUDENT] Alright, should we get this interview started?

[CLIENT] Let's do it!

[STUDENT] Ok, so this interview is just to show you where I'm at in coding the project and get some feedback and improvements to add. First here you can select a sheet size or go custom, for which you can input a height and width of the custom sheet.

[CLIENT] Alright, you got the four sizes, perfect.

[STUDENT] Thank you, had to go through our previous interview to find those. The code is going to automatically make the width the longest dimension, which was one of the assumptions I made while coding this. Just below there is a place to enter your designs which takes inputs of the Design ID, its height, width, and demand. The color will automatically populate when the layout is up and running as a sort of key so each design can be identified. There is an "Add

Design” button which adds a row each time it is clicked. No remove design button but the user is definitely going to know exactly how many designs they are trying to place, right?

[CLIENT] Exactly.

[STUDENT] Definitely not speaking from experience... Anyways then you’ve got the fit designs button which will take the sheet input and design inputs and try to fit them on the sheet, with the output being seen in this box on the right. I’ve made it so that if the code is unable to place all the designs, another button pops up for the exhaustive fit, as well as a warning for the consideration of human intervention. Thus concludes my tour of the GUI. We’ve already discussed much of the behind the scenes coding in past weeks off record, so I figured the GUI was the newest piece that you haven’t seen. Do you have any recommendations or improvements for me to add?

[CLIENT] Well, there is the layout of designs, and the remove design button which you already said you were planning to add. What outputs does the code make?

[STUDENT] Let me see... . So right now when the designs don’t fit “Designs do not fit. To fit the designs on the sheet some human intervention may be required.” is the output, and for a success the output is “All the designs fit”, new line, “Sheets required” then whatever the value of the most demand is.

[CLIENT] Sounds perfect. I got nothing to add.

[STUDENT] Thank you, thank you. I think thus concludes the interview, unless you have something else to add?

[CLIENT] Nope, looking good.

[STUDENT] Well then, enjoy your vacation in Germany, I’m looking forward to seeing pictures of the trip, and see you in the new year!

[CLIENT] I’ll be sure to send them then. See ya!

Interview 3, Date: 2/3/2024

[STUDENT] So this is just gonna show you what the final product is.

[STUDENT] So just, you know, play around.

[STUDENT] You have the sheet sizes there. It's not even gonna read in. It won't read in custom because you haven't selected "Custom" for sheet dimensions.

[CLIENT] Oh, silly me. Oh, this is for the sheet. So those are the designs.

[STUDENT] It's just a big table.

[CLIENT] And I can insert the height and width this way, okay?

[STUDENT] Yeah.

[CLIENT] And demand stays one?

[STUDENT] You can change demand, you can do whatever you want with demands.

[CLIENT] Okay. And will it be an issue if I have ID one here being zero, zero?

[STUDENT] Not at all.

[CLIENT] All right.

[After entering in first test cases]

[CLIENT] It's beautiful. This is beautiful and I love it. What else do you need from me? What do you want me to impart my wisdom on?

[STUDENT] I mean, what do you think of it?

[CLIENT] I love it. It's exactly what I needed. Let me bring up some actual other cases.

[STUDENT] Perfect, break it.

[CLIENT] Yeah, yeah, give me a second to break it. 'Cause this was me just learning how to enter buttons.

[STUDENT] And please try to break it intelligently because I already had my friend break it stupidly.

[CLIENT] Oh, what did they do?

[STUDENT] They entered in decimal places. I put something in there to catch that.

[CLIENT] Oh yeah, no, we don't need that.

[STUDENT] And then they broke it using negative numbers and I'm like, yeah, no. People aren't gonna enter negative numbers there.

[CLIENT] Yeah, I want it to break if someone enters a negative number. Okay, let me remove everything so I can, oh, actually, I probably can't.

[STUDENT] Yeah, use the button.

[CLIENT] Oh yeah, right. That makes sense.

[STUDENT] It's quirky like that.

[CLIENT] Actually, maybe I don't even need to remove. Let's not remove. Okay, I'm gonna try this one.

[STUDENT] Quirky, I love it.

[CLIENT] Quirky and we love it. Okay, so this one may or may not break.

[After entering in second test cases]

[CLIENT] I could probably stop, but I'm not going to.

[STUDENT] I don't want you to. I want you to break this.

[CLIENT] Well, it'll be interesting if it actually like, can lay it out in general, like using the normal one or if the fit exhaustively will work.

[CLIENT] All right, so let's see. All right.

[CLIENT] Oh my gosh, it worked.

[STUDENT] Yeah.

[CLIENT] (laughing) Well, it can't have that. I gotta break it a little. Hold on.

[After 25 minutes of trying to trick the algorithm, we eventually decided to see if a human could fit one of the test cases that the algorithm had determined could fit]

[CLIENT] Okay, human is able to make it fit with a lot of strife. (laughs) Check me, I dare you.

[STUDENT] Yeah, that's it.

[CLIENT] It's perfect, no qualms.

[STUDENT] Yes!

[CLIENT] And you didn't even have to fit exhaustively, which is crazy.

[STUDENT] I know, it's like, it's crazy how it, like, this heuristic was pretty simple, but like it helps a lot.

[CLIENT] Yeah, like have you found, did you have a test case where you had to fit exhaustively in order for it to work?

[STUDENT] I have not found one yet, no. So I haven't found one that requires the fit exhaustively. I just have it as a button in case, something like that does pop up.

[CLIENT] Yeah, it might be like with a lot more designs, you'll have to fit exhaustively.

[STUDENT] But I definitely noticed that on a previous test case, there was a little bit of a blink after selecting to fit exhaustively. There's a little bit of time lapse, but not a lot.

[CLIENT] Right. So probably like, how many designs was that?

[STUDENT] Six or seven?

[CLIENT] Yeah, so probably if you scale it up to 20 designs, it'll take a few seconds and then 40, we might be talking an hour.

[STUDENT] Yeah, yeah.

[CLIENT] But I mean. Yes, that's perfect.

[STUDENT] Thanks for trying to break the program.

[CLIENT] Thank you for having me and thank you for making this piece of software that works better than, I mean, for every test case we would need it, it works perfectly. And it works faster than we were expecting.

[STUDENT] Yeah.

[CLIENT] So, good job, [STUDENT].

[STUDENT] Thank you.

Appendix B: References

Citations for Source Code

Oracle Corporation. (2024). Java SE 19 Documentation. Retrieved from

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