Code	Subcodes	Definition	Sentence
WDST Improvement	*Field deletion*	A field that needs to be changed, clarified or organized in a different way since it does not satisfy the domain expert	P2 - “Step responsible and who, who conducts the step and where does that happens? I feel like a lot of the times it's going to be the same I don't if there's often people that are, I mean it was like personally responsible for one step in the workflows. Where does that happens? Would it be like in our cluster? Maybe it's um, if it's, maybe it's different for different facilities.”
	Structure		P3 - “I think this one might be quite difficult to follow. So maybe if you want to loop, do you mean loop through the tools? At first if all in one tool you will have five outputs. You run several of them is this output use in other steps. Yes, but not all of them. Maybe. Maybe just one. Then it's difficult to know which one, if yes step name then they have to. Yes. So let's see, I have several here. so i just put the next one. Um, but if it's for the example you use in tool 2 needed tool file outputs, but it doesn't say what inputs. So if I want to have from them tool one, I want to have input in tool 2” --- “we were running several tools in the same step with the same inputs. So all of them generated like five different output files and of these output files some of them were put into one process or another step. Well, some other ones what do you use as an input into another step, So different kind of steps for 2 different branches so to say, so not in one, the same workflow.”
	Understandability		P1 - “It's the step, the initial workflow point. I don't understand this.”
			P1 - “So with a step you don't mean tools, because they can be multiple tools in a step? So at one step could be one tool. But you have the option to specify more. Yeah. Because it's a part of one step.”
			P4 - “What, what do you mean with threshold here?”
	Lack of instruction		P1 - “Not all of these maybe are applicable in all cases.”
WDST Missing fields	*Field addition*	A field that is not described and the participants felt it is important to have included	P2 - “I don't know if you would want to like specify exact settings of the tools.”
			P2 - “Like maybe here is like specific settings and like if there are things here, like the reference as I mentioned, like if you need to write it need to have a lot of different inputs to the same tool, there'd be like a mess here. But then you could maybe just like have boxes are like references and like arrow there and then like see the table. And there it's like more fully described.”
			P3 - “So one thing is sometimes we do have more tools. you can parallelise your workflow and for example, for variance calling. I don't know what biological knowledge, but for for variance calling you can run several programs in the same time. If you have one file from the beginning with all the raw data and you want to process them through different tools that none one after the other, but one at one time and then merge the results together in the end.”
			P3 - “I don't see here is parameter setting, but that might not be something”
			P4 - “and also sometimes we have to say which, which version of the tool that we use.”
			P4 - “Yeah, Its just like, in some, each step there are several parameters or um, like normally when we write like a publication in the, when, when we want to publish some tool in the methods part either for researcher or for more bioinformatics method, we like say that, okay, we used this first X tool kit with the parameters this, this, this”
WDST Usage	*Knowledge sharing*	The participants' perspective of how the WDST can be used.	P2 - “sharing workflows with other people.”
	Structuralization		P2 - “to help me design it myself / useful to structure, to structure your thoughts.”
			P3 - “it's very good to have something similar to this just to create some structure around it.”
	Formalization		P4 - “we have some kind of structure like this but it's never like formalised.”
	System Documentation		P1 - "I mean it could be used for documentation. Like we have to, when we create something we have to validate it with the hospital people cause we have to make sure everything keeps a certain quality that the hospital requires. And um, yeah, it could be useful to put into their documentation system.”
	WDST Format		P2 - “I mean not in a paper format, but it can definitely be like a, I don't know, like an excel sheet or something”
WDST Users	*Stakeholders*	The people described as users of the documentation	P3 - “I think this is good for everyone that creates workflows. And maybe for the ones that are interested in using them.”
			P4 - “I think that it's useful for people that are developing workflows kind of, because people that use bioinformatics tools, they, they just like, they need to know what, how, how do you run and sometimes they have to know how to run several steps and then maybe it can be useful that they have some documentation or something like that.”
			P5 - “I think the ones that designed it. I think, definitely and there's bioinformaticians if you design it then you can use it of course.”
			P1 - “I don't know if anyone would be like looking at it, but it's, it's, I mean we have to write a bunch of stuff that I don't think anyone ever reads it. It's just needs to be there in case of someone needing to read it. But it's like a hospital bosses and things that actually validate these documents.”
WDST Current State	*Free text*	The participants' description of how workflows are currently documented	P1 - “I mean normally they want us to write like more simple something that anyone can understand it as well, like free text like this does that.”
Test of the WDST	*Test of the WDST*	The participants said that by using the artefacts they could find missing fields and improvements easily	P1 - “I would have to like try to fill it out for one of the workflows I have in order to see like”
			P2 - “I mean I think i would need to, like, try it out. I think and see.”
Notations & Concepts Improvement	*Understandability*	Notations and concepts that required further explanations or that caused confusion	P1 - “when we draw things we use a computer cluster and there are different like networks the things exists on so I like to have like a separate, okay so this is happening on our cluster and this is happening on the external server somewhere and this is like program that you run locally on your machine. So like kind of separate where it happens” (SWIMLANES)
			P1 - “So loops, you mean like, if condition, if the output from this tool does not meet the requirements, you send it back and you do something” --- “Yeah cause usually like when I write the loops I have them like contained in like a tool. So I would have like input and output. But what happens here, I wouldn't really describe loops and things in there. Oh, normally when I do things. But of course it could be. It can be useful to have.”
Missing Notations & Concepts	*Addition*	Lack of notations and concepts, identified by the participants	P1 - (data types) “it can be like some some shapes for the most common ones but they can also be , like what an option to put in if it's some lesser used that doesn't have like a shape assigned to it.”
			P2 - “I don't know if there's some workflows have a ton of like references it could be like 15 or something; like data inputs it could be like the human genome or, and some like database software. There's genetic variation and there's like five different kinds. I imagine that there is a lot of different data boxes or converging on one tool, I don't know if this would be like a data table kind of thing. Have like, uh, input data and then it's like a sort of like a table formats. Where'd you can type in the different, um, different data inputs, maybe.”

Code	Subcodes	Definition	Sentence
Notations & Concepts Usage	*System Documentation*	The participants' perspective of how visual notations and concepts can be used.	P2 - “I think we have need of it sometimes. I mean personally, we don't really use it a lot to help ourselves, but, um, if we have to document our workflows for like the hospital to put it into their like documents system. Then we have to design these things.”
	Structuralization		P2 - “I think some people would like to do with this before they designed the pipeline and use it to help them figure out how to, how to create the pipeline before they even start”
			P3 - “I like the diagrams it’s so much easier to follow. Yeah. And when you put all the inputs and output files here you have an overview in your head like this is how it's actually looks.”
			P4 - “that would probably be useful to structure a bit. Like what, what is the input and output of each step"
			P4 - “sometimes it can be good to see like a diagram also to understand what this”
Diagram Users	*Bioinformaticians*	The people described as users of the modelling language	P2 - “only going to be bioinformaticians.”
			P4 - “Yes, I think so. Yeah. Because it's, it's um, like, because I'm going, I'm working on this pipeline. I'm going to to write the documentation, like what, what you should do in each step, but sometimes it can be good to see like a diagram also to understand what this”
	Stakeholders		P5 - “Everyone that creates workflows, I think they can use it. Definitely.”
Notations & Concepts Current State	*Box and arrows*	The participants' description of how workflows are currently represented	P1 - “I mean we work, we make workflows that are like look like diagrams in a program called CLC where you have different tools and you have like an input and you just draw an arrow to another tool and output from that to another tool.” — “I'm usually just drawing like each program has a box and then an arrow and then the name like file on the Arrow and then to another box.”
Notations Preference	*Loop*	The selected notations and the participants' reasoning	P1 - 2a “because for me, I, I I don't, I wouldn't think of it as like a loop when I hear loop. I think of like on Arrows, I guess. More like a for loop.”
			P2 - 2a
			P3 - 2a “I might like these arrows just to know exactly where the loop ends and where it starts. Maybe it's a bit difficult. I like having these, what's included in the loop and you do know that. Yeah, we get you have it here. It should be, but it's not as easy to follow from exactly from where it starts and where it ends. um, that could be quite confusing here. 1a is more beautiful, But 2a you can actually see and follow, where it breaks and where it starts again, where the loop goes.”
			P4 - 1a “I think this is more clear, this like the inner loop here. Hmm. All or . Yeah, I think, yeah, I think this the left one.”
			P5 - 2a “because it's more familiar. So then that's why I think it's easier because we were used to all these arrows back and forth. Okay, so you're quickly see that then it goes, where it goes.”
	Thresholds		P1 - 1a “I don't mind either way of putting it. Actually. Maybe this one is a bit clear. When you have those, the two like in this case with a hard or soft thresholds. Okay.”
			P2 - 2a
			P3 - 2a “So visually I think this one is better”
			P4 - 2a “Maybe 2a, but I am understand both”
			P5 - 1a “I like the Idea of it like that.”
	Input/Output		P1 - 2b “I wouldn't mind this one. If it takes the inside of this box and I like it when it's on the side here. so, in that case I would like this one or I mean as as long as the actual type, is always in the same shape kind of. So here you have the file name. So BAM SAM. Well the way it looks here otherwise like I don't, I wouldn't mind it if it was connected with this one for example. So I don't think this Arrow is really needed. Maybe, So either if this one was bigger and the text was inside of it or.”
			P2 - 1b “I like these smaller boxes. I mean it's um, it makes it less cluttery”
			P3 - 1b “I like this idea. That's what I thought about when I looked at this one like input and the box i never seen it before and but I think it's good. This is more what I've seen before.”
			P4 - 2b “I prefer this one. What the, yeah, the because here is the same twice, right? Yeah. Yeah, because it did in this one it's more clear that the output from this step is the input to the next step.
			P5 - 1b “Because it doesn't take that much space. I mean I think it would go for this one if people start using them. so you get used to it cause I know how it is when you're fit. This takes up much more than that.”
	Datastore		P1 - 2b “this one, you know, it looks like a stack of disks.”
			P2 - 2b “stands out more compared to the other”
			P3 - 2b “Familiar with this one.” -- “So this one, this is all going to printed in my head as a database.”
			P4 - 2b "This one was just because I more used to it”
			P5 - 2b “because I’m used to it.”
	Tools		P1 - 2c “I like this one”
			P2 - 2c “I preferred the tools. I mean the the gears”
			P3 - 1c “I like this one better but of course it's easier if you just see it quick and wants to know what, what do I need to install, it depends on who you are, who you are, who's going to look at this one. Okay. Because if you are someone that are not going to use, to install and doing things that I think this one is better because it's easier to just see. But, but I like this one better.”
			P4 - 2c “this is more clear with the gear”
			P5 - 2c “I like this one, it's quickly seen.”
	Diagram separators		P1 - 2a “I like this way more these ones look a bit big with the number I also like the dotted lines are like this one is all included in, okay”
			P2 - 1a “I mean these are more clear obviously like the triangles. Just say speed up. What did their different, more different compared to like, I mean this is a box and these are all like box like things whereas this is a triangle, which is the only triangle that's in the graph. So that helps.”
			P3 - 2a “I think maybe I think this one is more is beautiful, but both are equally are good at following”
			P4 - 1a “no it's just, it's because it's like a different symbol that the other ones, so it's clear that it should be, it’s almost an arrow here.”
			P5 - 1a “because it's easy, I think it's easier to follow it because you can see it in the arrows where it goes, cause I don't really understand the fence.”
Artefacts Usage	*Redundancy*	The redundancy between the artefacts	P2 - "And then I think like there's so much here that's, that would be redundant when you're using this.”
	Order	The order of artefacts usage	P1 - “you will draw the diagram and then after fill this, yeah. And I would use the diagram for filling this”
			P2 - “I'd use the diagram first.”
			P3 - “I would definitely go with diagram first and that was writing this one instead of the opposites.”
			P4 - “I think draw the diagram first and then specify first the steps.”
			P5 - “I will do to the diagram to get the overview and then fill it. Yes, I would. then you have visualised it how it looks like and it's easier to fill it I think”