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|  | Timespan | Content | Speaker |
| 1 | 0:00.0 - 2:06.5 | So ID04 nice to meet you and thank you very much for being here today ... [introduction to the interview]  Now if we are looking at your general experience with additive roughly how many products or components have you designed for additive manufacturing? | Interviewer A |
| 2 | 2:06.5 - 2:11.1 | I would say less than ten. | ID04 |
| 3 | 2:11.1 - 2:17.1 | Okay and how often did they come up? | Interviewer A |
| 4 | 2:17.1 - 2:25.3 | Ah, maybe once or twice a year | ID04 |
| 5 | 2:25.3 - 2:41.9 | And what proportion of your projects is with additive manufacturing for series production, I mean for additive manufacturing is used as production technology? | Interviewer A |
| 6 | 2:41.9 - 2:50.4 | Okay I really consider it once, maybe twice. | ID04 |
| 7 | 2:50.3 - 3:17.3 | If you have to consider the projects you did with additive, as production technology, the times you used additive for tooling or prototypes or one-off or you used some other technologies, how much percentage can you give to this four? | Interviewer A |
| 8 | 3:17.2 - 3:31.2 | Maybe 10% percent. | ID04 |
| 9 | 3:31.2 - 3:35.7 | Okay and do you think this is changing? | Interviewer A |
| 10 | 3:35.7 - 3:40.5 | I hope it will change. | ID04 |
| 11 | 3:40.5 - 3:57.4 | Okay. In my email I asked you to identify some components or products you have designed which have been produced in series using additive manufacturing, what are the products or components that you have chosen? | Interviewer A |
| 12 | 3:57.3 - 4:48.2 | First, it's a range of spinning tops; so I decided to work with additive manufacturing because it was easier, in this case cheaper than working with other techniques and it allowed me as well to produce just -- make to order the products, so there was no waste and no big investments as well. | ID04 |
| 13 | 4:48.1 - 4:53.4 | I mean easier, what do you mean by easier, easier to design or easier to be manufactured? | Interviewer B |
| 14 | 4:53.4 - 5:16.7 | Easier because I just could make a 3D and send it and receive the final objects. So I didn't have to go through all the process of making a mould or even contacting anybody to help me wth the development or anything. | ID04 |
| 15 | 5:16.7 - 5:21.9 | Can you show us some of the material you used to design this component? | Interviewer A |
| 16 | 5:21.9 - 6:18.0 | Yes, these are actually the first models I made so they are not -- well they are the first models. Yeah they are not quite (()) [background noise] something I have solved after that, just as well it was interesting because I could, with 3D printing, I could actually play with the weight of the different parts so empty some of them and have more weight at the end, so the spinning top was working better and it was cheaper as well. | ID04 |
| 17 | 6:18.0 - 6:32.4 | Thank you they are very interesting. So how did you decide to produce these products using additive? | Interviewer A |
| 18 | 6:32.3 - 7:11.0 | How did I decide? Ah I don't know it came as an evidence of just something quick and, yeah, because I wasn't -- actually the first idea was to just have quick prototypes made and I realize that actually it could be the end product. | ID04 |
| 19 | 7:11.0 - 7:18.6 | And which technology did you use to make these components? | Interviewer A |
| 20 | 7:18.5 - 7:26.8 | Ah is -- I'm forgetting the name, the powder one . | ID04 |
| 21 | 7:26.8 - 7:37.2 | Selective Laser Melting, because they look like yeah. Is it laser melting? | Interviewer B |
| 22 | 7:37.2 - 7:40.2 | I think so yeah. | ID04 |
| 23 | 7:40.1 - 7:41.3 | Did you consider any other processes? | Interviewer A |
| 24 | 7:41.3 - 7:51.1 | No, I mean -- you mean in the 3D printing or in general? | ID04 |
| 25 | 7:51.1 - 7:51.2 | In general. | Interviewer A |
| 26 | 7:51.1 - 7:54.6 | Ah in general yes, yes. | ID04 |
| 27 | 7:54.5 - 7:55.5 | Which ones? | Interviewer A |
| 28 | 7:55.4 - 8:11.0 | Ah wood. | ID04 |
| 29 | 8:10.9 - 8:21.8 | And do you remember what were the main considerations because you decided to use 3D printing? | Interviewer A |
| 30 | 8:21.8 - 9:08.8 | Not really, no. Maybe something more in the details, I would probably would not have done these few bits if it was made in wood or any other material because it’s really fragile and yeah I would probably not go for complex shapes and do something more simple. | ID04 |
| 31 | 9:08.7 - 9:22.6 | Were there any other considerations regarding the cost, the mechanical properties, the appearance, the accuracy and the materials? | Interviewer A |
| 32 | 9:22.6 - 10:17.7 | Yeah the accuracy is something definitely amazing that I can just made a 3D and have exactly what I designed. Cost wise to a certain extend I think it works for small series. If you go to bigger scale I am not sure it is the best way to produce things, but I really, low investment stage, it’s definitely very attractive. | ID04 |
| 33 | 10:17.7 - 10:38.8 | So you said, you just designed these components and then you decided well you went through prototyping and then you will get prototype, you got the prototypes that you thought well these are good enough to become final products. | Interviewer A |
| 34 | 10:38.7 - 11:14.3 | Yeah, well, when I thought that prototyping -- the other ones that were firstly made with -- handmade with wood, foam or various materials and yeah, when I received these, I decided to go for 3D printing for all of them. | ID04 |
| 35 | 11:14.3 - 11:23.5 | Okay so and how did the design change when you decided to make these components with additive? | Interviewer A |
| 36 | 11:23.5 - 11:51.8 | Ah as I said, I played with the weight on the spinning tops, so I could empty some of the interior of it, just having a shell and some of the parts are, I decided to keep the material plain, full so there will be more weight. | ID04 |
| 37 | 11:51.7 - 11:57.1 | And how did you do that? Can you explain a little bit more how you changed the weight of certain parts compared to others, did you use any specific software or ? | Interviewer A |
| 38 | 12:08.2 - 12:09.8 | A 3D software. | ID04 |
| 39 | 12:09.7 - 12:13.7 | Is the name called 3D software? | Interviewer B |
| 40 | 12:13.6 - 12:19.3 | Ah no, no is called SolidWorks. | ID04 |
| 41 | 12:19.2 - 12:32.4 | So you mentioned, you changed the weight of the parts or components in the product, so from this example, I suppose it is solid 100%, right? | Interviewer B |
| 42 | 12:32.4 - 12:45.0 | Yeah these are all solid as I said, these are the first one I made. Then actually all the once I have made after that I sold them. | ID04 |
| 43 | 12:45.0 - 13:01.2 | And you also mention you can empty the interior to reduce, to further reduce the weight and from this design or other these two I cannot see any holes or something that you can use to let the powder out. | Interviewer B |
| 44 | 13:01.2 - 13:19.4 | Yeah, no, no, no. So okay, so for this older version actually I made from different like many, many parts and then I just assembled them together. | ID04 |
| 45 | 13:16.9 - 13:17.9 | Right okay. | Interviewer B |
| 46 | 13:17.9 - 13:24.1 | So they are not -- so you make the single parts and then you glue them together. | Interviewer A |
| 47 | 13:24.3 - 13:25.2 | Yeah. | ID04 |
| 48 | 13:25.1 - 13:28.2 | In Solid Works or after they have been made? | Interviewer A |
| 49 | 13:28.2 - 13:30.1 | No, after they were printed. | ID04 |
| 50 | 13:30.1 - 13:31.2 | Ah Okay. | Interviewer A |
| 51 | 13:31.1 - 13:40.8 | As he said, it’s just because otherwise the powder would not get out of it so you need an opening. | ID04 |
| 52 | 13:40.8 - 14:24.8 | Okay. So now I am going to ask you to immerse yourself again in the experience of designing these products and let's imagine that all the design process you did has been video recorded and is in a DVD and now we are taking out the DVD and we are watching it again. So did this design come about? So I mean why did you design these products as they are? | Interviewer A |
| 53 | 14:24.8 - 15:48.2 | Honestly, I started because I wanted to have fun with something. It wasn't a specific commission or I didn't even want it to -- Well, I was not imagining to have final products, I just wanted to have fun. And for a while I had fascination with spinning tops. So I decided to design my owns. So I made models, prototypes and 3Ds and because some people started to be interested in them, I decided to sell them and at that moment 3D printing became the best way to produce them. | ID04 |
| 54 | 15:48.1 - 15:59.5 | So you did not know, when you designed these products, at the first beginning, you didn't know that you were gonna use 3D printing as production technology to? | Interviewer B |
| 55 | 15:59.4 - 16:01.6 | No, no, no. | ID04 |
| 56 | 16:01.6 - 16:15.8 | So, having got the prototypes and then you looked at the quality and the colour and everything, so then you think that’s okay and people thought that -- people were interested in those products so you decided to sell them? | Interviewer B |
| 57 | 16:15.9 - 16:17.3 | Yes. | ID04 |
| 58 | 16:17.3 - 16:35.3 | What do you think Interviewer B, should we ask the questions about the design considerations at the concept stage, embodiment? | Interviewer A |
| 59 | 16:35.2 - 16:37.5 | Yeah we can ask. | Interviewer B |
| 60 | 16:37.4 - 16:46.5 | So what were you considerations during your concept stage, during your idea generation? I will change a little bit because since you basically did not know you were going to make these components with additive, I imagine at the beginning, you didn’t think about additive, right? So when you saw the first prototypes made in additive, did something change in your design? | Interviewer A |
| 61 | 17:14.1 - 17:44.5 | No, I think it started when it became a product so that's the moment I decided to slightly redesign everything to. | ID04 |
| 62 | 17:44.5 - 17:48.8 | And how did you redesign them? | Interviewer A |
| 63 | 17:48.8 - 18:10.8 | Ah, same thing, the pots, actually reduce the quantity of material used, balanced the weight better, to first have something really functional and less expensive to produce as well. | ID04 |
| 64 | 18:10.8 - 18:20.8 | How did you know when you changed the design, slightly. So how did you know that the cost would be lower? | Interviewer B |
| 65 | 18:20.8 - 18:35.4 | Ah because for the company and using it, they charge for meter cube of material so if you. | ID04 |
| 66 | 18:35.4 - 18:37.1 | So it is just change the volume, then you. | Interviewer B |
| 67 | 18:37.0 - 18:46.9 | Yes. | ID04 |
| 68 | 18:46.9 - 18:59.7 | When you were designing these products, did you follow any specific design guidelines? or rules? | Interviewer A |
| 69 | 18:59.6 - 19:23.5 | Ah I imagine, I get the images for inspiration. Anything spinning, so this is probably why this one is called carousel. | ID04 |
| 70 | 19:23.4 - 19:27.0 | Can you explain a little bit more on that? | Interviewer B |
| 71 | 19:27.0 - 20:55.4 | Ah it is a carousel like in a fair. So, so well you know how, I’ve brought a (camper), so these are all of them and each one was actually a different inspiration. So these ones for example I put little fringes like in the -- yes it was, well all the process was just to put into the spinning tops the inspiration I found, many things spinning I liked. Ah yeah I guess just symmetry as well although the constraints of the objects draw the shape. Is that answering your question? | ID04 |
| 72 | 20:55.1 - 20:57.1 | Yes, it is. | Interviewer A |
| 73 | 20:57.1 - 21:39.8 | Can I ask another question in the design? As you mentioned, you add something, as you like, because you like () so you just added them. Because we all know that additive manufacturing, 3D printing, is the enabler for customisation, so, customisation, we can have customer input into the design, so you can customise the product for that specific customer. When you changed the design, did you consider any customers' design [Interviewer B meant customer's input/desired shapes] or something? Because you just added as you wish. | Interviewer B |
| 74 | 21:39.8 - 21:45.5 | Yeah, well, definitely, it's possible to change all the colours or. | ID04 |
| 75 | 21:45.4 - 21:53.5 | Yeah, did customers give you any suggestions on what they wanted and then changed your design? | Interviewer B |
| 76 | 21:53.5 - 22:04.6 | I could have, but changing most of them, we are happy to look to (what I had). | ID04 |
| 77 | 22:04.6 - 22:20.1 | Now I want to ask you another question. So the time you decided to make this component with additive, did you follow any specific guidelines or rules for designing components for additive? | Interviewer A |
| 78 | 22:20.1 - 22:57.0 | They were just, I mean the constraints and the guidelines are already specified on the, I'm going through Shapeways. So they have a really complete guide on what you can and cannot do. So I just referred to this. | ID04 |
| 79 | 22:57.0 - 23:02.9 | Did you use the Shapeways guidelines or did you refer to something else? | Interviewer A |
| 80 | 23:02.8 - 23:04.9 | (only them). | ID04 |
| 81 | 23:04.8 - 23:31.4 | Do you think for this component, this product, are there any drawbacks or limitations as a result of this being designed for additive? | ID04 |
| 82 | 23:31.4 - 24:01.1 | Maybe some little details are more fragile than I thought. Otherwise, I don't see much drawbacks. | ID04 |
| 83 | 24:01.0 - 24:15.9 | So when did you realise that? After you got the prototypes, then you noticed that some details, the struts are fragile than you expected? | Interviewer B |
| 84 | 24:15.9 - 24:41.7 | Yeah, basically as anything I had to experience a little bit to see but yeah, I didn't know that. Because you see here, that's really strong and actually it's quite soft when you go to the small scale. | ID04 |
| 85 | 24:41.6 - 24:57.0 | So when you realised that, I mean, after you got the prototypes, then you realised the struts, they were fragile than you expected, did you change anything in your design? | Interviewer B |
| 86 | 24:57.0 - 25:09.5 | Yeah, I made actually this bit, because, you see, there is, this one is slightly bigger, here and here, so I just made it even. Larger here. | ID04 |
| 87 | 25:09.4 - 25:16.9 | And at that time, did you consider using other additive manufacturing processes rather than using SLS? | Interviewer B |
| 88 | 25:17.0 - 25:28.4 | No, really. | ID04 |
| 89 | 25:28.4 - 25:34.3 | Did the use of additive manufacturing change your design process or practice? | Interviewer A |
| 90 | 25:34.3 - 26:16.7 | In some way, because I, maybe I spent less time doing models myself. When I'm pretty sure about the design, I would rather make a 3D and send it for 3D printing, rather than spending hours and making a thing (let's say) for prototyping. | ID04 |
| 91 | 26:16.7 - 26:39.4 | Ok, thank you very much. Now we are going to ask you some general reflections, what are your thoughts about additive and design for additive? So what are your views on additive manufacturing as a production process for end user products and components? | Interviewer A |
| 92 | 26:39.3 - 27:50.1 | I think there is a, but I'm not sure, actually it just changes all the production process because one could just, for example, buy an on-line design, just have the file, built to the closest 3D printing shop, customise the product and have it printed. Or it could, as well, enable anybody, really, who can use a little bit computer to have things, well, putting it a shape again. | ID04 |
| 93 | 27:50.1 - 28:01.3 | And, in general, what do you think designers need to know for designing effective parts or products for additive manufacturing? | Interviewer A |
| 94 | 28:00.9 - 28:51.4 | I don't know. From my point of view, it's still really a prototyping tool. I should get more into it and consider it as full technique and start to challenge the boundaries of this technique, then there could be something interesting coming out of it. | ID04 |
| 95 | 28:51.4 - 28:57.0 | What do you mean by challenging the boundaries of this technique? | Interviewer A |
| 96 | 28:57.0 - 29:09.4 | It means just going as far as possible to see what's going on. | ID04 |
| 97 | 29:09.3 - 29:11.2 | You mean in the prototyping stage? | Interviewer B |
| 98 | 29:11.2 - 29:50.6 | No, in the product stage. Actually, this is, well it's good in design is using any technique and, like just seeing what's going on if you go further and further and further, developing this technique until you see that you cannot go any further. So that's something that designers could do. It's not just using the technique, but actually challenging the technique. | ID04 |
| 99 | 29:50.6 - 30:16.3 | So can I interpret your, I'm not sure my understanding is right, so, if you were given a design guide, a complete design guide, showing you all the limitations of the additive manufacturing techniques, would you think that would be more helpful rather than yourself challenging the techniques? | Interviewer B |
| 100 | 30:16.3 - 30:22.3 | I guess, yeah. | ID04 |
| 101 | 30:22.3 - 30:28.0 | How did you learn how to design for additive? | Interviewer A |
| 102 | 30:28.0 - 31:01.0 | Just by myself, testing. Maybe I went to, online, to see some blogs. | ID04 |
| 103 | 31:01.0 - 31:05.2 | Which blogs did you see, if you remember? | Interviewer A |
| 104 | 31:05.2 - 31:08.8 | I don't, really. | ID04 |
| 105 | 31:08.8 - 31:24.0 | Now you have designed it for additive and you have experience in it, did you come up with your own rules? Do you have some rules that you made by yourself? | Interviewer A |
| 106 | 31:24.0 - 32:06.9 | Maybe just be careful on the really thin parts on small details because, from my experience I can see that it's, can be done, but it's still really fragile. | ID04 |
| 107 | 32:06.8 - 32:23.8 | So, in the next 5-10 years, how do you think additive manufacturing as a production process will influence design? | Interviewer A |
| 108 | 32:23.8 - 32:42.9 | There might be more things made. Not sure I'm happy with it but. | ID04 |
| 109 | 32:42.9 - 33:01.0 | Might be more things made by additive manufacturing. What kind of things you mean, in terms of the geometries of the parts or just the quantity of the parts? | Interviewer B |
| 110 | 33:01.0 - 33:20.8 | Just the quantity. I'm not sure about the quality but it's just the quantity because, even now everybody can build its own machine and start printing things. | ID04 |
| 111 | 33:20.8 - 33:31.7 | How about materials? Do you think that additive manufacturing will be used more on metals or plastics? | Interviewer B |
| 112 | 33:31.7 - 33:50.4 | The one I'm really interested is in glass. I've recently seen videos of the, I think it is the MIT. That's a 3D printed glass. | ID04 |
| 113 | 33:50.4 - 33:56.8 | What process for making the glass? | Interviewer B |
| 114 | 33:56.8 - 34:12.8 | It's kind of just; I think it's similar to the ones used in metals just. | ID04 |
| 115 | 34:12.6 - 34:18.9 | Is the glass in the liquid or in the solid form or in the powder form? | Interviewer B |
| 116 | 34:18.8 - 34:28.8 | It's melt so it's in liquid. | ID04 |
| 117 | 34:28.8 - 34:47.2 | Ok, so, thank you so much for your time and your thoughtful observations. It's been exceedingly helpful. Before we go, I would like to ask you something, final details about your background. What is your educational background? | Interviewer A |
| 118 | 34:47.2 - 35:13.0 | I have the Masters degree in product design, graduated in Strasbourg, France. | ID04 |
| 119 | 35:13.0 - 35:17.1 | How long have you been working as a professional designer? | Interviewer A |
| 120 | 35:17.1 - 35:29.9 | Now, three and half years since I graduated. | ID04 |
| 121 | 35:29.9 - 35:39.2 | So, can I confirm that it is ok for us to take pictures of your products? | Interviewer A |
| 122 | 35:39.2 - 35:43.5 | Yeah, actually I can just send you pictures if that would help. | ID04 |
| 123 | 35:43.5 - 35:45.2 | That would be great. | Interviewer B |
| 124 | 35:45.2 - 35:49.6 | Is this project in the public domain? | Interviewer A |
| 125 | 35:49.6 - 35:51.9 | No. | ID04 |
| 126 | 35:51.9 - 35:55.3 | Can we use it as a case study? | Interviewer A |
| 127 | 35:55.3 - 35:56.9 | Yeah. | ID04 |
| 128 | 35:56.9 - 36:23.6 | Ok, so, in the following weeks, we will transcribe this interview and we'll send you a copy to check if we understood correctly what you told us. If there is anything you want to add or remove, so feel free. Just one last question, do you prefer to be named or be anonymised. | Interviewer A |
| 129 | 36:23.6 - 36:32.3 | I don't really mind having my name. It's just, it depends on what. | ID04 |
| 130 | 36:32.3 - 37:32.7 | Ok, ask by default, we'll anonymise everybody. So and then, all the interviews and material you've given to us will be protected, (retaining) you signed before under the Data Protection Act. So (you will) be anonymised and make sure all the relevant information you give us will be (given a code), which is not related to your name, and protected and stored. Although, by default we will do that, if you don't mind to be named in any of the papers or books we are going to published in our website or videos, then we are happy to name you if you are ok with that. | Interviewer A |
| 131 | 37:32.6 - 37:34.9 | Yeah, I guess. | ID04 |
| 132 | 37:34.9 - 37:40.2 | Ok, so, that's it. | Interviewer A |
| 133 | 37:40.2 - 37:59.8 | Can I ask one last question about this thing? [Interviewer B meant the spinning top] Maybe you have answered but I don't seem to remember. So what's the production volume for those? How many parts did you produce for each product? | Interviewer B |
| 134 | 37:59.8 - 38:11.9 | In all of them, it's a really small thing. It's less than 100 I think. | ID04 |
| 135 | 38:11.9 - 38:17.0 | Less than 100. That's 50 to 100 or 25 to 50? | Interviewer B |
| 136 | 38:16.9 - 38:17.8 | Yeah, more 50 to 100. | ID04 |
| 137 | 38:17.7 - 38:29.9 | And how many different kinds of this object do you have? Do you have only these three ones, then you have sold ten of these, ten of these and ten of these? | Interviewer A |
| 138 | 38:29.8 - 38:33.8 | Now, only this. | ID04 |
| 139 | 38:34.1 - 38:35.2 | You have only this? | Interviewer A |
| 140 | 38:35.1 - 38:39.0 | I mean, no. Uh, what do you mean? How many? | ID04 |
| 141 | 38:38.9 - 38:58.0 | You said in total, you made roughly between 50 to 100 of this spinning. Are all of them the same design or all of them different designs? | Interviewer A |
| 142 | 38:58.0 - 39:04.9 | Uh, well, they are in, like some of these, not only this string. | ID04 |
| 143 | 39:04.9 - 39:10.8 | Ok, so basically, these 50 that you've made, they are all in different shapes, kind of? | Interviewer A |
| 144 | 39:10.7 - 39:53.2 | They are all following the same designs. I'm not sure I understand. Ok, not all of these because I removed this, and probably, uh, I don't remember one of these but ok, so, these designs, I can 3D print and so it depends, but yeah I sold like 50 or more of them in total. | ID04 |
| 145 | 39:53.6 - 39:58.6 | Which means, for this one, you sold maybe three? | Interviewer A |
| 146 | 39:58.5 - 40:00.5 | Ok, yeah, that's it. | ID04 |
| 147 | 40:00.5 - 40:06.2 | Yeah, that's what I wanted to say. Cool. | Interviewer A |
| 148 | 40:06.2 - 40:13.8 | Thank you very much. | Interviewer B |