

## Episode 71

# Open Source, Digitally Manufactured Homes

The show notes: [www.houseplanninghelp.com/71](http://www.houseplanninghelp.com/71)

Intro: WikiHouse 4.0 has been on display in London so I thought it would be a great opportunity to intercept Alastair Parvin, the co-founder (of WikiHouse).

You may know about Alastair already because there was a great TED Talk he did called 'Architecture for the People, by the People' and I thought that this could actually be a good introduction to him today if you haven't heard of him.

'Designer Alastair Parvin presents a simple but provocative idea. What if, instead of architects creating buildings for those who can afford to commission them, regular citizens could design and build their own houses. The concept is at the heart of WikiHouse, an open source construction kit that means just about anyone can build a house, anywhere.'

So that sets the scene. I started by asking Alastair for a bit of background about himself.

Alastair: I trained in architecture, trained at the University of Sheffield, and I think there was an interesting point when we were working out it was the peak of the boom times. A lot of people were complaining, "it's bad design, architecture's not what I thought" etc, etc, and a lot of people started to want to leave. And I was like actually *this is fascinating* because it means that the whole of economics behind cities and buildings doesn't work the way that we think it does.

So I began researching the way that financial capital shapes our housing and then beyond that the nature of our housing crisis. So for me it came from two angles, which is one yeah it was research into why is it that a relatively prosperous nation has a housing crisis. Why are we building such poor quality small homes, second smallest homes in Europe etc, and what's going wrong there? And then from the other side just a curiosity about these new technologies, digital manufacturing and the web and how they were, and are going to, completely reshape our civic framework, not always necessarily for the better.

And was there a way that actually, yeah, we looked at the open source code movement and we saw in there obviously a technology that did have a very promising or very interesting civic framework behind it that was potentially going to outperform the existing model. We realised pretty quickly that that was going to move from code into real things. So everything, all the disruptions that we've seen happen to media through YouTube, or YouTube has done for films, what Wikipedia has done for knowledge is all coming into the world of physical things and we realised that actually you could do such mundane things as build houses with it.

Ben: I think before we go too far you ought to explain to someone who doesn't know much about this, what is WikiHouse?

Alastair: So WikiHouse is an open source construction system which we are trying to develop. It's really trying to produce something at the intersection of digital manufacturing and open source sharing of design solutions on the web so we are trying to make it possible to effectively share and download design solutions, 3D models and cutting files which you can then effectively use to CNC cut, to digitally manufacture parts for a house. And the parts are all numbered and named and you can then assemble like a giant flat pack customised, high performance, hopefully relatively low-cost house.

Ben: Obviously utilising the internet so it's accessible anywhere in the world, who is this aimed at?

Alastair: In a way it's not a question of who it's aimed at, it's approaching from the other direction saying that there are certain technologies that are potentially useful and we know we all have certain common needs around housing, the technologies that go inside housing. We know that those technologies are expanding so it's not just about the construction system it's also going to be about the devices we put inside our homes and the servicing inside our homes etc. And realising that if we could disrupt the way that those actually quite mundane technologies, we're very used to the idea of "house", it's not a new technology right, we can change the way that they're made and also who makes them.

So in a way I could say that there are certain people right now who are picking up on WikiHouse, obviously self-builders and custom builders etc, etc, but I think the more long-term aim is to say *let's develop something very very useful and then see who uses it.*

Ben: I know you mentioned a little bit earlier on about how this is developing and it's coming about, so we've actually got the Version 4.0 outside here in London and I've had a look around. So maybe you could tell us the evolution of that house.

Alastair: So, yeah in a way it probably should be 0.4 or even 1 in the sense that all the many many prototypes that have been done by us and others up to this point have been just testing and developing and developing the system. I think this is the first system where for the first time I think we can say, *look, we know we can make a house this way.*

So we're doing a 2-storey house with a 4.8m room span which we've developed through with Arup's engineers and also Momentum engineers and others. But embedded within this prototype right now is a load of work by a load of people that has been drawn in on and particularly the WikiHouse New Zealand team who came up with a load of the innovations. They took our system and improved it and we've readopted their improvements.

Ben: Open source is very much contributed by many, is that how this works at the moment? I mean there's no ownership or anything?

Alastair: Well there is, I mean this is the thing. There is ownership over open source. It's about the license that it's shared under and you have to be quite focussed about what it is that is actually open source. It's not some, you know, you can't get lost in bland rhetoric. What I mean by open source is that the intellectual property, in this case the cutting files and 3D models which are detailed manufacturing information, are all shared under a CC (Creative Commons) license which means anyone can access them for free and edit them, and update them etc. Anyone can do that, whether it's for profit or whatever it is, and the question is who owns that knowledge. Well, I mean that's a knotted conversation but we are very interested in making sure there's a good, robust, neutral governance system behind it. So we've established, we just began experimenting with this project and we've now established an organisation called WikiHouse Foundation, which is a non-profit foundation, much like Wikimedia Foundation or Mozilla Foundation which exists to be, if you like, the custodian of that knowledge to say actually that knowledge will be belonging in commons in perpetuity and then let the community, of which we are also a part, continue to develop it.

Ben: If I wanted to build a house this way, we know that affordability is one big driver of this, but am I able to? Who do I need to make this work?

Alastair: Right now the people adopting it, because it's still at the early stages, are really co-developers. They're designers who are getting into the system and co-developing the system. I think if you are just an end user with no, you know, you can do it, but you'd really have to get into it and do your research. The truth is, as Linus Torvalds said, the reality of doing an open source project is trying to get it out of your inbox, and a lot of it is still in our inbox.

So we're working and working to try and build a better web infrastructure and stuff to make better sharing of the information that we do have. I think we're getting much closer to the point where actually just as an end consumer you can actually engage with these design files and stuff more quickly.

Also what we'll begin to do is actually make available to say, look, here is say in the first ones we'll do this for is sort of a studio that you can build in your garden, but sub-consent under your general permitted developments and we'll say look here's all the design files so you can go away and make this for yourself if you want to. If that's too difficult also there's us and hopefully a whole range of other companies who will help you manufacture it, who will help you assemble it etc etc.

Ben: The cutters themselves, are we expecting more people to have ownership of this or will there be one in your community?

Alastair: Yeah, that's happening all the time already. I mean there's a growing number of CNC workshops available. Actually they're also all over-stressed so the price fluctuates in the sense that they realise they can charge more so in the net in general the price is coming down, but every so often they will fluctuate. But you know equally the performance of those machines and the ability to buy one is going up so it's becoming more and more realistic to buy one, and actually if you were doing more than one house, you know if you were doing a neighbourhood of houses, it would become totally economic to just start with buying a machine and manufacturing them yourselves.

Ben: What makes these affordable?

Alastair: The key element that the affordability of these brings is the ability to do work yourself. Invest what's called sweat equity. If you can make a system where it is hard to get wrong and quick enough that you can build it yourself then it means that you no longer have to, as parts of the work, probably not all of the work, but many parts of the

work which you can do yourself or with your friends. So that is one area of bringing affordability.

Another area of affordability is actually predictability. Because actually in current custom build you don't have to just be rich enough to afford it but you have to be able to be rich enough to afford it and the uncertainty of how much it might go over budget. So having products that get you closer and closer to being much more predictable is a very helpful thing about affordability.

And then I guess another thing, which is the same as all custom build - which people don't realise - is that simply by buying the house and the land separately there's a whole load of things that you're not paying, which are production profits, marketing stuff etc etc. And the OFT estimate that's about a third of the price. So the same house custom built would be about two thirds of the price of the house on the market.

Ben: Is it always going to be built from the same plywood? Is it that's just the system?

Alastair: Yeah, now that's an awesome question and I wish more people asked that more often because a lot of people look at it and say, "it's about plywood". No, already it's about any structural sheet material. The principles and the ways of thinking and working a WikiHouse could apply to a huge number of potential technologies. I guess the common thread is digital manufacturing and open source. Now there's many ways of 3D printing buildings that are emerging, going to be very very interesting. Our current system works in some economic and climactic contexts but it would be useless in others.

So all we're doing is developing one system that works now, with a disruption we can make now in the hope that that will grow and build and we can begin to, you know, make other ones in the future or more importantly, others want to, because that's the heart of open source. That people take something, they say "hmm, could be better". They fork it, they improve it and that's what we're doing.

Ben: Energy efficiency - let's get technical here because we've done a lot on things like Passivhaus, so I know that airtightness is important. Are there any issues in terms of making this an airtight structure? Windows - you tell me?

Alastair: I mean the truth is of course we're still developing it so we don't know. On paper we can do some extraordinary things. So one thing

we know we can do is it gives us these high energy performance walls so we're talking U values of 0.14, which is good enough. You could go up to Passivhaus just about with that. So the areas of uncertainty is we still haven't tested are things like leakage around windows and all that kind of thing. The thing that's in our favour in that is that with CNC production you've got tiny tolerances. So this building out here, the difference between the length of the building in the model and the length of the building in real life is 5mm, which is pretty tiny. So it means that when it comes to being able to control those tolerances of course you're actually onto a bit of a winner because it makes it a heck of a lot easier to then airtight your building and that's our aim to be able to achieve very high outcomes, but I'm not going to claim that we can do it until we've proven it.

Ben: I visited the Facit Homes, one of the ones that was on Grand Designs, and interestingly chatting to the clients there they thought that if they were to do it again they'd factory build having gone through all of this. So what are the benefits of the portability?

Alastair: I can't, I mean you'd have to ask Facit what their view is. I mean I think Facit are doing more and more factory building anyway just for the economics. The truth of the WikiHouse is you can build it however you want. You can take a CNC machine on-site. We quite like the idea of a house that has a CNC machine inside it and sort of builds itself. That might not happen for a while but we'll see.

Most of the ones we're doing are essentially they're made in a CNC workshop, then we put all of the parts into a van or a couple of vans and we drive them to site. You've got the risk, the disadvantage of that is if you find you've got a piece missing, so you have to be quite disciplined or be able to respond to that. The advantage of doing it on-site is of course you can respond to stuff like that. Obviously the disadvantages of doing it on-site are obvious in the sense of there's all the logistics of hooking up and all that kind of thing.

So the truth is there will be many different potential business models around how people find it's the most efficient way to do it but the most useful thing I think about what we're trying to do is to say that actually our parts are all carryable. That's quite useful, especially if people want to build them on rooftops or wherever because you can actually just carry the parts up there, but again it lowers the amount of kit that you need to build one of these things.

Ben: And how does it actually go together? Do you just have to be very careful as to the order that things are loaded and dropped off on-site?

Alastair: Yeah, I mean the logistics, getting things in the right order, is actually in some ways harder than building it and we're trying to evolve this system. There's this Japanese design concept "Poka-Yoke", which is basically fool proofing: making it impossible to get wrong. So we're trying to do that as far as possible so you're really building by numbers.

In this case it was in the middle of a city that we just did this one and most of the problems we had were around logistics rather than actually the thing itself. But yeah, one of the problems is for example you need space to lay out the parts and it's very susceptible to rain, so actually you need tarps or a gazebo or something like that or whatever. It actually makes it much easier if you have something like that to lay out the parts so you can find the right numbered part as you build it, so there's a lot of those things about process which we just develop but you know our model is just iterate, iterate, iterate and try not to make the same mistake twice.

Ben: Looking from a designer's perspective for a moment. Obviously this is something that is accessible to anyone, so how are we getting a bespoke design? Something that's interesting, something that's creative?

Alastair: Well imagine saying to . . . I mean the twist on this is people think you're making it possible to not hire designers but the irony is that the more you do that the more people then want to hire you as a designer, because they can't afford to hire you for 6 months as a designer, but they can afford to hire you for a few weeks or a few days.

So imagine someone coming to you and saying actually I want you to design me a house but I want you to design me a house using this system. Like it were Lego. And that way I know I can build it myself and that you will know that it's going to work because this has been tested by many, many people before but they're still going to come to a designer to say actually I don't know how to design a house. I want you to respond to the needs of my family or you know whatever. So actually I think most users of the WikiHouse system will be professionals. You know, small local companies, small designers, maybe big companies as well, manufacturers selling their services to custom builders.

Ben: Last couple of questions. We've got the house here in London. What were you aiming to do by having it on show for people to have a little wander around?

Alastair: Two things. One is to do our experiments in public which is suicide, but we've always done it and why not. So we haven't rigged this, genuinely we're doing our experiments in public. If it all goes wrong it all goes wrong in public. You know we've been working on WikiHouse for a long time and we wanted to demonstrate that we were getting it across the reality line. This wasn't a fiction, some massive industrial revolution that was going to happen in the future. This is something we could do right now, and also partly there's a broader context to this which is we wanted to raise these debates as we've been trying to do. To start these conversations and to challenge local authorities, developers, the government, to say actually if this is now possible why is it still so hard to buy a plot of land, get planning permission? You know in other words, where's our right to build.

Ben: What are some of the key comments that you find people saying as they wander around, or questions they ask?

Alastair: Why has it got no roof on it is the main one at the moment.

Ben: Why has it got no roof on it?

Alastair: Basically because the construction sequence is that you build the first storey which has handrails in so you can build the, if you like the second roof, that creates a safe working platform to build the second roof so essentially we've tried to design out scaffolding frameworks which is a big win.

Unfortunately the constraints of this site and this project meant that we didn't have the resources or the time to do that complete house so what you're seeing here is, if you like, a half-finished two storey house to test that process. We didn't want to, you know, we want to make one jump at a time so that's why this house doesn't look, it looks like a box rather than looking like a house shape. That's been one of the questions that has come up. The other ones are how much is it going to cost, is it available now. A lot of people want, they're like is it available now and we're like, oh man we really have to get organised!

Ben: They think it's a show home, don't they, that you're trying to sell them something!

Alastair: Yeah, yeah, because we're so used to the idea if someone's doing something like this they're being sold something, and we're saying no, no we're developing this. I mean if you're a pioneering client and you want to commission us now you can, and some people are. But in terms of absolute you know, readiness, we're getting there but we're not being salesmen here, we genuinely are trying to do an awesome thing and then, somewhere down the line, find a way to earn a living and for others to earn a living using it.

Ben: That's a good point. And how do you learn from this specific house? You mentioned that it's an experiment.

Alastair: The lessons are endless and myriad and what we'll be doing is getting all our volunteers together at some point and having a big debrief. And we'll get a big shared Google doc and we'll put all the notes, everything through every stage of the process, every little glitch, everything that needs to be improved, everything that went wrong, in a very soul destroying but useful document.

Ben: And one final question, I know you're a busy man. What is the future of all of this and how quickly can it happen?

Alastair: Well as I said there is no destination, there's only a direction of travel and we'll just go as far as we can as fast as we can. I think obviously our hope now is that there'll be much greater adoption. There'll be the ability to earn a living by selling and using WikiHouse which will of course accelerate things tremendously. We can build better web infrastructure and hopefully from the back of that WikiHouse Foundation as well can do a better job of supporting that. We will begin to see not just WikiHouses popping up in the UK and around the world, but also the beginnings of emerging new technologies.

In this prototype already we're seeing some amazing stuff that Arup's done. We've got an open source heat recovery ventilator, we've got these open source house control systems you know, "The Internet of Things", all these devices are going to transform our lives. At the moment most of the options are running off platforms where our data is owned by a company some thousands of miles away so the ability to open up, literally create an open space for these services, these plug and play services and devices, and I think we'll start to see a much greater diversity of the technologies and be involved in WikiHouse and maybe even beginning, I think this might be a while yet, to expand into other construction methodologies, but based on the same principles. And

as we've said hopefully also beginning to develop neighbourhood development models that address the problem, not making things easier, not just at the scale of the house, but at the scale of a whole neighbourhood.

Ben: Alastair, thank you very much.

Alastair: Cool, thanks very much.