

Episode 133

Building automation and KNX – with Paul Foulkes from Echohouse

The show notes: www.houseplanninghelp.com/133

Intro: Today we're looking at building automation, the centralised control of things like heating, lighting, ventilation, etc.

Is it something that we should be incorporating into our projects? Could it also help us save energy or just encourage us to plug in more gadgets?!

Paul Foulkes from EchoHouse is going to help us understand how it all works. However, I started by asking him to tell me a little bit about his background.

Paul: I'm an engineer by trade. At 16 I did an apprenticeship and I worked on aircraft for 10/11 years. Then in the mid 90s I moved into the construction side of things. At the point there the natural progression for me was to become an electrician, household electrician and I quickly started looking at building automation, renewables, that side of thing. So it sort of grew out of there.

A key factor that happened was that I installed an intelligent system, heating system for someone, for a client. About 2 years later they phoned me up and one of the parts on it had failed. So I went back to the manufacturer and said: "I need a replacement for this part." And they said: "Oh we don't make that anymore so you'll have to replace the entire system."

So immediately I started thinking about this whole idea of proprietary systems and the disadvantages with them, that you're tied into that one company.

And then someone turned round to me, one of my suppliers, and said: "Why don't you look at KNX?" And that was the start of the journey and that was in early 2000 and by 2003 I was a qualified KNX installer. And coming back to what I said, it's a non-proprietary

system, 400 manufacturers across the world so you're never short of a piece of kit and it's backwards and forwards compatible.

Ben: You've already jumped a long way, so let's bring it back to our discussion point today which is building automation. What is it?

Paul: Building automation allows you to look at the systems within your house and operate those in a more efficient manner.

So generally with a standard house, if you've got a simple light switch it doesn't mean that much. But once you start layering into that a heating control, now granted that's not valid within Passivhaus, but you are looking at ventilation control, maybe shutters to control solar gain, or just for security. Once you start layering in these systems then being able to have all these under one roof, under one protocol, makes it much simpler and much more effective. So you can bring in your security, your access, your blinds, your shutters, your lights. You can then also start looking at things like environmental monitoring, temperatures, heat gains, solar gains, VOCs (Volatile Organic Compounds), CO₂ monitoring, heat detection, smoke detection. All of these come under one system, one protocol and bring it all into one central point.

Ben: In our houses at the moment, this just doesn't apply, does it, I'm assuming? Thinking about what we've got, unless you've organised your house with all the sensors and the wiring that it needs, we don't have this?

Paul: No we don't. And there is the question of saying well do we need it, but then you could say do we need to be looking at a lot of things within our house. There is a huge amount of talk of smart homes these days, Nest, the Apple Home Care Kit, all of these sort of areas, so people are talking about this and they are talking of app-based systems that attach onto your boiler, onto your heating system.

We are already looking in that direction of being able to access our buildings, access our homes, from our phones or from our computers, and also to be able to have more information about our homes. 10% energy savings across a year quickly starts to add up.

Ben: And thinking about it, we're very much new build so this is the perfect opportunity to make the most of it while you can, so what are the first steps then if we're looking at our new house? You mentioned all these smart systems, now whether I think they're

good or bad, I think they're coming! So what should we be prepared for?

Paul: It's really a case of trying to stand back from a system, or from your building, and look at everything within the building.

One of the sort of problem areas I find with smart homes as such, is that if you want to look at a heating system you talk to your plumber. If you want to look at something to control your lighting you'd talk to an electrician. So straight away you're already talking about multiple layers. You're adding in complication and the idea of all of these systems is really to simplify your life. So do you really want your house run by 12 different apps, different systems, or do you want it run by 1 app?

So it's the point when you're planning is to step back and then that's the time when you're looking at all of your windows, all of your insulation, all of your wall finishes. You're taking a broader view or you're asking your architect maybe to take a broader view. You should be doing this with your electrical system as well.

Ben: Do we need to get this right first time, because otherwise we've got to take stuff out of the walls again?

Paul: Definitely. And that's the time to do it. It's to look at it from that point. Don't start building and then look at your electrics as an afterthought, which from my years of experience of actually installing electrics in houses, people do it all the time. Design fabulous buildings and then go how are we going to light this, how are we going to heat it, how are we going to control it. It's always the afterthought. It's like think of it from the beginning. This applies to ventilation.

Ben: This applies to everything in self build. Everyone's answer is just think of it at the beginning. The trouble is we haven't been through this before to know and we've never talked about wiring on the podcast, so what wiring does a house have? At the very basics and then building it up to where we might want these smart systems.

Paul: You're always going to have your circuits for sockets, for outlets, power outlets, you're always going to have a need for lighting in each of the rooms. That's your fundamental. You're then talking about an overlay on top of that of controlling a heating system if it's installed, any form of heating. You're then talking about your ventilation system. That's something key with the modern builds with the airtightness. You're then starting to look at your air quality,

monitoring your air quality, which will then feed back to your ventilation system. So it's this constant layer of systems and bringing them together as opposed to always looking at them at different disparate systems or installations. Bring them together, look at them at one time.

Thinking just of taking one step forward let's say, what about if you want to put an electric car into your house, attached to your house. You've got a charging point. Any renewables you put onto your house, solar thermal, solar electric or PV. Battery systems, going off-grid with a Tesla wall and all of this. Any sort of energy storage. You need to be looking at all of this now and saying I can put in a system that will control all of this the most efficiently.

Ben: And does that bring us back to what you mentioned first of all. I've already forgotten these initials. Do the initials stand for anything?

Paul: No they don't. It's KNX and it's the worldwide accepted building automation standard. So it's accepted throughout Europe, America, Australasia and China. And it's difficult to get standards accepted across the world.

Ben: I was about to say it's very, very tricky, so does it have any other competitors or can we breathe nice and easily that this is the only thing? Someone's not going to tell us 5 years later, why have you got that one?

Paul: KNX has been around for 26 years so it's not a new technology. It's not just dropped onto your doorstep now sort of like a Google Nest. And it's building automation, it's not a heating control system or a smart home system. It is building automation. It's used, it's fully scalable so I've actually got it in my own house and it goes all the way up to buildings like the British Library, Terminal 5, Bird Nest Stadium, so it is completely scalable from large down to small.

One of the key things, partly the same, as I said before it's non-proprietary.

Ben: What do you mean?

Paul: It's not built by one company. KNX is a protocol. KNX is not a company that manufactures a piece of kit. It's not sort of like Honeywell Evohome or Control 4 or Loxone which are one company, they sell you one piece of kit. If that goes wrong you have to go back to them.

Ben: So online the equivalent would be open source, is that what you're saying?

Paul: Yes. It's called open protocol.

Ben: Is there kit though that's needed for this? There must be something physical within the house, or not, it's just a computer?

Paul: No, you don't need the computer.

Ben: Hold on! As you can see I'm a beginner here. Hold on. You don't need a computer?

Paul: No. It's an addressable bus system. So every item that has a control, so an input or an output into the system, so think of an input being a switch, an output being an actuator that controls your immersion tank for your water. So you can turn your water tank on and off. Those are the points within the system. Each one of those is addressed so what you then do is you link each of those together. You have a piece of software that you carry out the linking with.

Ben: Hold on, so we do need a computer!

Paul: No. Only to commission it. You then take that away. Each individual item is its own individual system. So there's no central hardware, there's no central processor. So you don't have a centralised point of failure. You don't have a WiFi router, you don't need WiFi. So you just need the cable in place and then each individual piece of kit that's hung off the end of that cable. So whether it's a light switch or whether that's a touch panel, that doesn't matter.

Ben: Okay. I'm going to try and relay some of this back to you to see if I understand. So if we've only got this cabling and the switches and so forth and the feedback, this is happening in the cloud. What's the magic?

Paul: Nothing.

Ben: What?! How is it working?! It's amazing!

Paul: Each individual switch, I suppose the simple way to put it although it sounds overcomplicated, each individual switch has its own processor. Each individual actuator has its own processor. If you add an actuator the process is within that. That processor you give an address to, similar to an IP address, you give an address to and

then everything else in the system can talk to that. The only time you need a computer is to add that piece of kit into the system. You then address it, you then take the computer away, or the piece of software away that programs it, that commissions it, and it runs. And that's it.

Ben: I think we need an example.

Paul: Because it's a multi-noded address system, what's different from say like an IP system, is that you would need an IP cable, a CAT6 or a CAT5 cable to every single switch in your house and then feeding that back to a network switch in say your utility room. And then your outputs from that are connected to say a switch that switches on your immersion tank. That's a lot of cabling.

The advantage with a bus system is that it can be star wired, it can be Christmas treed, as long as the piece of kit is connected to the bus by two wires then you can address that piece of kit. So as long as you've got your wire to any position that you want an input or an output, you can hang what you like off that. And you can change as well.

Ben: I seem to be wanting a computer to be involved. What about controlling it then? If I want to make a change or do something within this system? I accept the fact that it all works without a computer, am I not using a computer then?

Paul: To make a large change to the system, yes you would. You would need a programmer system. This is where, I think from a home builder, this is where you will need someone else involved. You will need someone to commission the system. But you can install it. You can install the cabling the same as you'd install any other cabling and then you'd only bring in someone to commission the system. You can commission it yourself but you need to buy the software, and the software is €1000. But it's pointless doing that because you're only going to use it for once.

If you have, let's say in a bedroom you've got a switch that's got 4 inputs, let's say an on and an off for the light, an up and a down for your blinds. If you then wanted to change that to a 6 touch switch, so an on and an off for your lights, an up and down for your blinds, and maybe an on and off for a ceiling fan, the person that has then carried out the commissioning for you can carry out the set up that you want it to do and just post it to you. So they don't even have to come to your site. You then take the 4 point switch off the wall,

connect in the 6 point switch, it's two simple cables at the back, and you're ready to go.

Ben: Can we talk a little bit about the monitoring and what you would use it for. We know that it runs, it's automation, when would we use this monitoring?

Paul: Well the monitoring, again on a standard installation if you're just using lights, there's little need for monitoring. But for instance, if you had a photovoltaic installation you could monitor your input and output. You can monitor your own energy usage. So energy coming into the house, obviously if you're exporting energy as well you can have a look at that. All of that information can be monitored and then displayed however you want to. Whether it be in an Excel file or something graphical on your computer.

You can connect your home computer into the system via a USB plug so you just need to sort out a connection point or you can actually do it via WiFi as well. So you connect the building automation into the WiFi system. It doesn't need it but then via that WiFi system, via that router, you then get access via your phone, via a laptop or you can project that information remotely. So you could be abroad on holiday and you would still get the information about the house, so you could access the various monitoring stuff, or if the smoke alarm goes off you're alerted that the smoke alarm's gone off you can then cancel that smoke alarm. Or if you've got cameras in the house you can have a look in the house. So there's sort of all those levels of complexity that you can add into it if you want to.

Ben: Very much about saving energy and trying to simplify things as much as possible. So there's got to be a line somewhere where we're getting into gadgets that aren't always necessary. How do you define that line?

Paul: Personally, I'm not a lover of useless gadgets. I like a gadget but it needs to serve a real true purpose. If I can monitor the amount of energy that I'm using in my house I can then see the points at which the energy is being wasted. So that means that I can tackle those energy usages.

Something that I'm employing in my own house here, is every single room has a room monitor. Simply put it's a motion detector but it's an absence or a presence detector. It's also the room temperature controller. With that information from that room I can time the heating systems so that they will only operate when people

come into the room so that they will set back at specific times from 20 degrees to 17 degrees to 12 degrees. I can pre-programme all of that information into it, around a set of parameters that I set. That means that I can operate my heating system at the most efficient.

There's a set up time, it doesn't actually take that long, but once the parameters are in I can access those parameters. You can set it up so that you can access those parameters without having the commissioning tool, without having the commissioning programme so you'd then access that via your computer. So you as a home builder would have access to these to change the times at which your temperatures change. That's something quite normal. So it's like a standard programmable thermostat. But you would have it so that every single room is individual and then you'd have a layer of control on top of that, that if you set it to turn on at 10 o'clock in the morning but no one comes into the room, then it won't turn on at all.

Ben: Interesting you use heating as an example because we talk a lot about Passivhaus and this is something that has a fairly constant temperature. So I could say to you at this point, well all of this controlling heating, we've put a gadget in there to do that, when actually if we're being sensible about this we might go down a Passivhaus route and eliminate just that whole heating thing full stop.

Paul: Absolutely. There is no doubt, I've recently said about Passivhaus and KNX and one of the things that I've said about it was that Passivhaus does not need KNX. It doesn't need it at all. You can carry out all the functions within a Passivhaus.

But what Passivhaus addresses is the energy usage within that house, the heating energy usage or the energy heating loss, thermal loss. Once you've addressed all of that, what you're left with is the two active parts of energy use, which is lighting and hot water and ventilation as well to a degree.

So they now make up a massive percentage of the amount of energy that you're using. So if you can then add again that same level of energy efficiency to that as well, you are improving the efficiency of that building.

And also, the thing about Passivhaus is that generally a lot of them are designed as high end, high quality buildings. Do you really want white MK switches on the wall where you've designed this fabulous house, you're using amazing materials and some of them have absolutely beautiful finishes, that you look at the 7 shortlisted

buildings for the awards at the moment. These are fabulous looking buildings so why not complement that with a system within the house that is beautiful as well and is efficient and works. It does what it says it can do.

Ben: How would we get started if we decided we wanted this? What steps need to happen?

Paul: You can look up KNX on the internet. The wiring is very simple. I would suggest, although I'm about to suggest this, I am a KNX consultant, give a KNX consultant, any KNX consultant a call.

Ben: What makes you a KNX consultant?

Paul: Yes, there's the KNX course. There's a 5-day fundamental and a basic training that allows you to be an integrator and then after that there's the various top-ups and the sort of standard thing that you'd get. But your basic course is the KNX integrator course.

You can check that on the internet so you can find out if someone is an integrator. That integrator, that consultant, will guide you through the process and they are more than willing, on a vast majority of cases, they will let you put the cable in and then they will come along and just do the commissioning. But they will guide you through. They will help you create the right system. So the same as anyone else, we look at a set of floor plans and say this would be a good place for a motion detector, this would be a good place to monitor your temperature or your CO₂ levels or this is a place for your smoke detectors and this is how we bring the system. So they will plan the system for you. You then drop the cable into their schematic. You can even do the second fix, actually hang the stuff on the walls and then they will come along and boot in the commissioning program for you.

But as I said earlier, they could actually do that from afar. They can pre-programme the pieces of kit and post them to you, or you fit them and then they will email you the programme and you just upload it.

Ben: Google and Apple clearly think there is a future in data, in control in the home. You are bound to have quite a different viewpoint from me, so what are they wanting to do? Why are they so keen on this?

Paul: Well the Google and Apple thing I'll come back to specifically in a second. But the idea of having this information is being able to assess what you're using, energy-wise, within your building.

We are moving towards, whichever way we look at it, energy is going to be more expensive as we go on, regardless of the price of oil at the moment. There is no doubt about that.

There is also a question that it's going to become a much scarcer resource, whichever way we try and find it. There is the way that we pay and use our energy is going to change in the next 5 years fundamentally, where we're talking about half hour billing. So your electricity between say 6 o'clock and 8 o'clock in the evening could be 10 times the price of what it is overnight.

That sort of change in billing in energy usage will make things like battery storage within in a house all of a sudden really interesting because you could charge a battery when it's very cheap and then you rely upon that when it's very expensive.

All of these sort of levels, and as I said earlier electric vehicles as well, all of these levels of change in the way we use energy are dependent upon monitoring the energy that we use and being in control of the energy that we use. And you're only going to do that with some form of system, of intelligent system, within your house. And that could be anything. That could be the Google or the Apple system.

The problem that I have personally with the Google route and the Apple route is it's two-fold. One, is that both the Google and the Apple business strategy is to sell you new products between every 24 to 36 months. They want you to upgrade and update on a constant basis. The last thing they want you to do is go along, buy an Apple Home Care kit let's say, and then never ever have to upgrade it again. They don't want to do that. It's not part of their business strategy.

And Google have proved this. They bought Nest. Two years ago they bought a company called Revolve which was a smart home system, quite big in the States, much bigger in the States than it is in Europe, which they were sort of developing in parallel with Nest. In January they just pulled the plug on it. It was a cloud based system and they've just said, no more. So all of the kit that those people bought is completely defunct as of June 30th this year. It will not work anymore. So you have to completely replace all of your kit. Funnily enough they've offered discount rates to buy Nest. To buy Nest equipment. So they want you to constantly buy new pieces of kit and that in my mind is a fundamental problem with that business strategy.

Ben: Clearly they've got the brands, but this open source route, do you think it's strong enough just to keep moving forwards or will we always just be suckers for the latest Google gadget?

Paul: Well yeah. There's always going to be suckers for the latest Google gadgets. It is going to be there. But we come back to that point where say something like KNX, it has been around for 26 years, and the stuff that was fitted, installed, 26 years ago, is completely compatible with every single piece of kit that is built today. So if it breaks down you can still get a replacement for it. It may not be exactly the same item but it will probably do more than what it did 26 years ago. But you can still take that piece of kit out of your house, put a new piece of kit in, you don't have to replace the wiring, you don't have to replace the system. You don't even have to update the commissioning for it. It's still fully compatible.

So it is a system that's got all of the capabilities that you want it to have. But it's not a gadget. This is one of the key things. It has a different level of functionality within it.

Ben: I think we're getting towards the end of the podcast now. I've still got a few questions. One of them actually is on control. That on a wider scale we talk about us being in control, but is that always the case? Are we actually inviting someone else into our homes, say our energy companies, to just switch us off when they need to? Is that something that could happen?

Paul: The energy companies have been talking along those lines, that they will control the energy usage. I spoke about how the energy market will look in 5 years, but in 10 or 15 years again it's going to be hugely different. I think we're going down the lines of things like smart and local grids, community energy production.

And again what I said before still stands true, which is that you need a system of control. You need a system of control. And yeah, why not take it out of the energy companies hands and keep it in your own hands, or keep it within your community's hands, is something that I am actively working on with KNX for community energy systems, and this does involve community PV, anaerobic digestion, wind power, local battery storage both in houses and then local to that community.

And making things like housing associations, when they build 150 or 200 hundreds they can actually become a net exporter of energy. But again it needs a control system. In that situation there

are a number of different options about that you could use, it doesn't have to be KNX on that sort of situation. But to take it down to room by room control where you can look at it.

But yeah, the energy companies have a huge amount of influence obviously, so we need to take back that control from them and the best way is to know how much energy you're using all the time.

Ben: And then finally, what else do we need to know? As people who may not necessarily be doing this installation ourselves or using this, anything else that is good in an overview about KNX?

Paul: The flexibility within the system is without rival. It has huge implications for care of the elderly and moving into things like the assisted living, assistive technology area as well. So that makes it as you age you can adapt your house to you. There's no reason why you should adapt to your house. We've got the technology now, we've got the ability. If you're a home builder, you have that fantastic opportunity to look at your house and say this is my house for me now, what's it going to be like when I'm 70 or 80 years old. So you'll naturally look at how the house will adapt but everything else needs to adapt with it as well. So this is why KNX offers you that level of adaptability.

And as sort of like a general thing for homebuilder, I would say is that don't be afraid to ask someone else, someone that does know. You know people say it's expensive to employ a professional. It's like wait until you start paying for an amateur.

Ben: Good point to end on. Paul, thank you very much.

Paul: Thank you very much.