HOUSE OF LORDS

Select Committee on Science and Technology

Corrected oral evidence: Off-site manufacture for construction

Tuesday 8 May 2018

4.55 pm

Watch the meeting

Members present: Lord Mair (Chairman); Lord Borwick; Lord Fox; Lord Griffiths of Fforestfach; Lord Hunt of Chesterton; Lord Kakkar; Lord Maxton; Baroness Morgan of Huyton; Baroness Neville-Jones; Lord Renfrew of Kaimsthorn; Lord Vallance of Tummel; Baroness Young of Old Scone.

Evidence Session No. 6 Heard in Public Questions 41 - 49

Witnesses

Dr Sarah Williamson, Technical Director, Laing O'Rourke; Martin Kelly, Strategic Business Development Director, Severfield; David Hurcomb, Chief Executive, NG Bailey.

USE OF THE TRANSCRIPT

Examination of witnesses

Dr Sarah Williamson, Martin Kelly and David Hurcomb.

Q41 **The Chairman:** Welcome. Thank you very much for bearing with us and I apologise for the delay. As you will probably have noted, there was a Division in the House, so we had to stop the proceedings of the previous session in order to vote. Unfortunately, it looks as though it will happen again. Nevertheless, I feel that we should make a start, because there are many things that we are interested to hear from you.

I will begin by asking each of you to introduce yourselves, and if you wish to make an opening statement, please feel free to do so.

Dr Sarah Williamson: Good afternoon. I am the technical director of Laing O'Rourke and I have been with the company for the past six years. For the past three years I have been working predominantly on the Hinkley Point C project at Somerset as part of the bi-Laing O'Rourke joint venture with Bouygues Travaux Publics.

Martin Kelly: Good afternoon. I am the strategy director of the Severfield group. Severfield is a structural steelwork provider. Structural steelwork is one of the longer-standing proponents in the off-site environment. We have been working in a factory environment and delivering work to sites since the 1970s.

David Hurcomb: Good afternoon. I am the chief executive of the NG Bailey Group, which operates in the mechanical and electrical installation and maintenance space. We are a family-owned company that has been going for nearly 100 years. We started getting into off-site assembly manufacture about 17 years ago. I am a real champion of it and I would like to see lots more of it, so I am delighted to speak to the Committee today.

Q42 **The Chairman:** Thank you. Before I ask the first question, I should declare an interest in that I have an association with Laing O'Rourke, which is very closely connected to my university. I am also a consultant to Laing O'Rourke, although I have very little to do with off-site manufacture. My work with Laing O'Rourke is more to do with underground construction and tunnelling. I thought I should make that clear.

We have heard a lot about the advantages of off-site manufacturing. What are the barriers to the wider uptake of off-site manufacture?

David Hurcomb: I think it is about an understanding in the design community of how to design for manufacture. Most designers will have been trained many years ago in traditional methods, so they do not do not have the knowledge and expertise in how to design for manufacture. The commercial reality is that it is of no real interest for them to do that if their clients are not seeking it. So it is usually the contractors and the companies that physically install and build these buildings that get the most benefit in programme certainty and so on.

So there is a commercial reality here, along with a question of knowledge and skills. We are still very fragmented between design and construct, and unless you have design and construct in the same envelope, it is really hard to influence the client.

Martin Kelly: I agree. There is also something fundamental about the nature of the construction industry. It is a very large and fragmented industry, and the knowledge base in it is equally fragmented. There is a circularity—

The Chairman: I am so sorry, but already we are being interrupted. There is a Division in the House and we will have to stop the session. If you can be patient, we will resume in about 15 minutes.

The Committee suspended for a Division in the House.

The Chairman: We are now in a position to resume. Mr Kelly, if you can remember where you were, please continue.

Martin Kelly: I was following on from what David said.

There are three main areas where there are barriers. We have talked about one: design. There are challenges to off-site methods being specified from a design perspective. There is a challenge for the industry generally in that it is fragmented and the players are often quite small and not always suited to adopting off-site methods.

There is also an issue with the contractual structure of the industry in that it tends to be in silos. Similar trades do not work together as effectively as they could. There is a circularity in all that, which is that we cannot demand that designers design off-site solutions, because they will turn to the industry and point out that off-site solutions are not fully available, and so it goes on. That is the real challenge for the industry: how do we break the circularity of an adoption that has not fully taken place?

Dr Sarah Williamson: I agree with much of what David and Martin have said. In many instances, the barriers are more about perception and thus potentially more about cost. Rather than talking about the benefits of consistency of product, reliability of programme and a reduced reliance on traditional construction skills, what comes across is an increased up-front cost and perhaps in many areas a perception about quality. People have in their minds the prefabrication of the 1960s and 1970s post the Second World War, which is not at all like the componentised offering of off-site construction that we see today. There is that perception.

On organisations that are providing modular or off-site offerings, there is difficulty in seeing a pipeline. Significant investment is required in order to develop componentised solutions, whether in structure, MEP services or whatever it might be. Without the visibility and the demand, it will take something to push such investment forward.

There are other components in this such as the regulatory influence. I know that my own organisation has had some success with private clients who can see the benefits of certainty in programme. For example, a residential developer will want to know when they will be getting their

rental income, so they will be quick to see the benefit of having a componentised solution. We have started to bring a lot of things into this, and componentisation lends itself to being more what we call digital engineering. We get to the point where we have real security of programme and assembly sequence, and an enlightened client will see the benefit of that because within a short space of time they will have a realised programme that is producing income for them.

In other areas, it is more difficult to get that traction. Speaking from my recent experience in the regulatory environment, there is a massive drive towards safety, which clearly there should be, but with the slight twist that could move towards componentisation and modularisation, which would give an industry that traditionally has struggled with cost and programme the opportunity to achieve reliability.

I am sorry if that answer is rather long, but there are a number of intertwined barriers to the uptake of off-site manufacturing componentisation.

Q43 **Baroness Young of Old Scone:** Perhaps I may turn the question the other way around. Is there a silver bullet, a big breakthrough, or a leader out there who could break this cycle and make it happen? At the moment, it is going round and round with a small amount of incremental change, but it sounds as though that could take a very long time.

Martin Kelly: My view is that there needs to be a client who starts that circle. It is not for the supply chain to offer, it is for the client side to demand. There are a number of ways in which we can think about the circle. One is that certainly the public sector is a client, and if it chose to do so it could be more prescriptive about what levels of off-site are required in public procurement projects. Similarly, it could incentivise private developers to take a more off-site approach, in which case again you would see a top-down drive for pushing their designers to specify off-site, which would of course have the recurring reaction of the supply chain providing the right solutions.

Baroness Young of Old Scone: What sort of incentives would you see that comprising? How would you incentivise the private developers?

Martin Kelly: You are perhaps looking at tax incentives in the form of an extensive of R&D-type tax credits that would drive a different level of behaviour. An example is how effective it was for the construction industry when public sector projects insisted on adopting BIM. That has worked its way through and now it is not just public sector projects that adopt BIM because it is actually a good thing to do.

A huge number of private sector projects have now adopted BIM. The kick-start that came from the public sector requirement gave everyone enough time, understanding and financial incentive to say, "We're prepared to develop our understanding of BIM". I think we could get something similar in off-site.

Dr Sarah Williamson: I support that. There is a huge opportunity for the Government to use their buying power in public projects. There is

also something in planning and development. We have two ends of the scale. We have done lots of modularisation in off-site for highways projects and HS2. We have examples of Crossrail projects where the benefits have been clear to see.

At the other end of the scale, there is a huge opportunity in the housing market, but it seems to stick doggedly to its guns and building with bricks. However, there are requirements for developers to build affordable housing, so why not drive a bit of innovative thinking into that part of the market and ask them to consider off-site quality of design and other criteria than are currently required?

Lord Hunt of Chesterton: Could wholesale companies not exist that would make all kinds of beams and other elements, so that small builders could continue to operate but they could get these significant components? My impression is that that happens on the continent. In France, for example, you can have lots of houses, all of which contain similar components but they are designed differently. There must be a company or organisation that is producing all those components. Are there companies in Britain doing the wholesale construction and marketing of building components?

David Hurcomb: Not at the moment, because the UK is very much about control of the land. Once you have the land, you have the key resource and you will then want to sell your design, which is manufactured to a cost that will allow a return to be made.

There is no wholesale provider of the bigger components. Obviously roof trusses and so forth are very standardised, but not the actual layouts of properties.

Lord Hunt of Chesterton: Do you not think that it will happen in the future?

Martin Kelly: There is the potential for it. To some degree, elements of it have already happened in things like structural insulated panels and roof trusses that are pre-manufactured. You can get elements of pre-manufacture. Perhaps one of the challenges is that you will have a single trade such as roofing—roof trusses is a single trade—and we tend to be specialists in our own area.

Let us take the example of my company, which prefabricates steel. We limit ourselves to prefabricating steel. We could not move into the MEP space or the concrete space, because steel is all we know. One of the challenges is that most of these components require an understanding of potentially working with other trades or specialists, and we have not encouraged that in the UK.

Lord Hunt of Chesterton: It is clearly different, is it not, in some of the other European countries?

Dr Sarah Williamson: In Sweden, for example, 85% of properties use off-site prefabrication, so there is a massive opportunity in the UK.

Q44 **Lord Griffiths of Fforestfach:** I thank you for the evidence you have

given so far. What interests me in this session and in the previous session with people who are intimately involved in the industry is that one example after another has been quoted, including HS2, Highways England, BAA and GlaxoSmithKline.

First, on a scale of zero to 100, how much construction at present is actually done in this modular way in the UK? Secondly, if I were working for a company and the CEO told me to look after the construction of a new building, there would be dozens of examples of modular construction. I must ask, therefore, why this is not already happening.

David Hurcomb: It goes back to what I said earlier about the commercial reality of the way the industry works. If you want a building, you will appoint a team of professionals that is probably led by the architect and the designers who will want to design in the traditional way. The more hours they spend designing, the more revenue they make, whereas if they create a plug in and play, modularised and componentised system, I would think it likely that their fee income would decline quite substantially. They would be putting a series of components together to achieve an output specification. There is quite a lot of commercial tension in this.

Lord Griffiths of Fforestfach: Are you not looking for a Walmart or an Amazon to come along and say, "We'll take the initiative"? Going back to Baroness Young's question, if you had a leader, a disruptor, in the industry, that would change things.

David Hurcomb: Yes. It is most likely to come from overseas and perhaps from China, which is looking at some very serious technology, including the 3D printing of concrete structures. It has actually built a 20-storey office block. We will see that silver bullet of an organisation in the UK, but because of the fragmented nature of the commercial relationships it is very difficult, although it might happen.

Another thing that is driving the conversation today is that a chronic skills shortage is looming, and obviously we know that with Brexit that might get a whole lot worse over the next 18 months or so.

The Chairman: We will come to the question of skills later.

David Hurcomb: Going back to the reason for using off-site, if I was a client I would be thinking about security of resource to build my project. I would be thinking, "These guys use off-site and they do not need a lot of resource". I would be talking to the contractors who are utilising these techniques.

Q45 **Lord Fox:** We have talked about clients and different sectors quite a lot, and there seems to be a distinct difference between the commercial sector and the residential sector.

Dr Williamson, you have just said almost in exasperation that they are still building with bricks. I wonder if that is because the buyers of houses want them to be built of bricks. What market research has gone into what people want? If I was buying a new house, I would not buy one built

using a technology that had only been around for five years, because history has proved that in many residential situations it has tended not to be as good as it promised.

How can you convince not only the housebuilders but the people who will be buying the houses that perhaps they do not want to go for a brick-built house? What would convince me as the buyer of a house?

Dr Sarah Williamson: That is a very interesting question. I go back to the first point I made about one of the barriers, which is perception of the quality. You will think straightaway about a property that you may have seen as a child that was not of the best quality or you will think about places like Ronan Point.

There is another side to this, which is the risk factor for investors. As a self-builder, for example, you would struggle to get a mortgage. It is not a technical question that I can give an answer to, but a huge amount of work is now available that demonstrates that if you go for a componentised approach, the materials are understood. Going back to the 1960s, we did not really understand how in-situ products were going to perform and we made some fairly significant errors with reinforced concrete and salt.

Lord Fox: That is what I was thinking of.

Dr Sarah Williamson: If you lay out two plans—a brick-built house and a prefabricated, highly engineered product—while you cannot account for personal taste you could have something that is going to be a really nice use of space, is energy-efficient and sustainable. That is the kind of discussion we need, along with an understanding that this is not just about bolting together panels, these are highly engineered products.

Lord Fox: We have talked in other evidence sessions about using big public sector housing projects along the lines of Ebbsfleet to kick-start this technology. Is there a danger that it will be looked on as second-class housing because of the stigma of prefabs and so on? I do not have the data on this, but people seem to like brick-built buildings. Is there a danger that in using the public sector to kick-start this development, it might stigmatise it at the same time?

Dr Sarah Williamson: I suppose there is a risk, but if it is understood it can be mitigated. With some of the new prefabricated houses, if someone likes brick-built they can have brick cladding on the outside, which would also have been prepared in a factory in the warm.

Martin Kelly: We talk about housing and residential, and there is a part of us that will always focus on the two and three-storey green-belt estate that is being built by a housing developer, but actually there is a significant amount of development of inner-city, urban housing for the private rented model. Most of the residential in London falls into that category because of the density required: it needs to be towers. We should look at some of the new off-site solutions that are being driven in that market. It is certainly present in the PRS market.

Lord Fox: I was not expressing a personal view.

Martin Kelly: No, but there is demonstrable quality in that market and a traction that goes beyond the familiarity of bricks and mortar.

Q46 **Lord Borwick:** Could we talk about the business models in the construction industry? How would the cash flow change if you were to go for off-site manufacture? Presumably Dr Williamson can talk about this with some knowledge, if not with some caution, given her own experience in Laing O'Rourke. Is the cash flow better or worse when using factory components?

Dr Sarah Williamson: The models need to be significantly different. Laing O'Rourke has invested in a number of manufacturing facilities. There is the precast concrete facility in Steetley along with an MEP facility and another advanced manufacturing facility that is in the planning stage. The investment is being made, but for that model to work there has to be a demand for the products that come from the factories.

In effect, we have to generate the market that keeps the factories busy. That is where the industry needs to get to; in addition to that push, the balance needs to be tipped so that it becomes more of a pull.

Lord Borwick: Okay. You have made your investment and you have to wait and see whether you get a return, but how would the cash flow alter for the construction company that had not made that investment?

David Hurcomb: In the short term, you have a factory to buy and fit out and a workforce to train, which is quite expensive. I would say that you would have a number of years of investment. It is all about the continuity of the demand side.

Lord Borwick: What if you did not actually build the factory yourselves, but rather you purchased it?

David Hurcomb: You could rent a factory, which would smooth out the cash flow.

When it comes to getting paid versus traditional, to be honest, once you get going it is pretty neutral. I am assuming that you guys are paid by certain stage payments in the construction cycle.

Dr Sarah Williamson: Indeed, but the key is being able to envisage the demand that will support the investment.

Martin Kelly: The point is valid. You move from looking simply at profit motives to looking at returns on capital employed. The capital employed includes all the working capital that you might have to outlay through the process, because if you take complete ownership of a process from the sourcing of raw materials through to the design, on to the fabrication and to the ultimate assembly and erection, that will give you a higher level of capital employed than you would have in the traditional construction model.

Q47 **Baroness Morgan of Huyton:** Perhaps I may move on to skills, which we also talked about with the previous witnesses. Mr Kelly has alluded to the fact that there is already a skills shortage that we think will get worse because of leaving the EU and an ageing skills base anyway. Our previous

witnesses suggested that you could almost run this in parallel in the sense that the skills base will decline, but you should be developing a new skill set at the same time. Do you agree? What range of new skills is needed and what are the opportunities for filling the current skills gap with a new approach to off-site?

Dr Sarah Williamson: We have already started on that. On skills, a number of assembly apprenticeships have been started and this is a massive opportunity. The current key skills for civil engineering are concreting, reinforcement, fixing, carpentry and, on the domestic side, bricklaying. If we could let them go and not force people to work in those environments, that would be a positive thing.

The skills we are looking at now vary. From an engineering perspective, we are looking for people who understand data. We talk about BIM, but there is a lot more to it. It is not just about models and pictures. You need to understand data engineering and data science. We have people in civil engineering and even in the construction engineering teams who are data analysts and programmers who can work with the APIs.

Lord Hunt of Chesterton: What is an API?

Dr Sarah Williamson: I am sorry. We have people who can modify programs to suit our particular needs, so we need people who are very software literate. We have people whose job it is to sit inside the office and do the construction sequencing before we go to site, so the engineering is starting to look a lot different.

When we get to what used to be construction, we are now talking about manufacture. Today we have been talking about what we do in an actual manufacturing facility producing components that come off the assembly line, but even on a normal construction site we will off-line as much as we can and we will create components in a controlled environment. It is much more like manufacturing and you need fewer people on the construction site doing the assembly.

Baroness Morgan of Huyton: What level are the apprenticeships that you have just talked about? Are people coming to you at 18 or 16?

Dr Sarah Williamson: I would say at 16. We can get a lot out of people who have just left school.

Baroness Morgan of Huyton: And would you develop them in all of these data areas?

Dr Sarah Williamson: Yes.

Martin Kelly: Some of the traditional construction skills that we have on site will transfer directly into an off-site environment, but what might change is the element of mobility. London, for example, is a core site for construction activities, but it would not be a core site for off-site manufacturing. That is likely to be done in different places. Our facilities are in the Midlands and in the north, but in effect we all work in London. When you are talking about moving people from a construction site in London, even those with transferable skills may not be quite so available, given the geography.

Lord Fox: The world that Dr Williamson has just described is alluring, but when I walk past building sites in London I still see people up to their ankles in mud plaiting rebar on-site in order to create reinforced concrete structures. How much of what you have described is real and actually happening in scale, and how much of it is still aspirational?

Dr Sarah Williamson: I do not know the figures for the reality versus the aspiration. Take our London projects as an example. In the document that Laing O'Rourke submitted, we talk about one of our high-rise projects, Two Fifty One, which was fully componentised, but that was a landmark project for us.

Lord Fox: Is that the reinforced concrete component as well?

Dr Sarah Williamson: It is the reinforced concrete, the MEP and the cladding. The components came from various places around the country and they were assembled on a very tight London site. As much as possible we get rid of things like reinforcement fixing and the wet trades. The in-situ concrete, plastering and finishes are all done off-site. It is not the world now, but it is the world that we want to live in.

Lord Fox: It is the world to come rather than the world we currently have.

Dr Sarah Williamson: Exactly. May I add to Martin's point about the geography? It is not just that these components come from different places, they are actually made by different people, or they have the potential to be. This is a massive opportunity to tap into the diversity agenda once you start building things in a factory and thus away from the traditional construction site.

Lord Hunt of Chesterton: While the others were voting in the Division—I always get to the vote late—I was going to ask you some questions. You told me that the Hinkley Point nuclear power station will eventually have 10,000 people working on that site. How many of them will be apprentices?

Dr Sarah Williamson: I did not research that figure, but I could provide it. Both EDF and the contractors on the site have made significant investments into apprenticeships. We are working closely with Bridgwater & Taunton College and the University of Exeter, because they are running those apprenticeships for us.

Lord Hunt of Chesterton: So you will be instrumental in producing a very large number of apprentices.

Dr Sarah Williamson: Yes. We are about to start a digital engineering apprenticeship, which involves something like BIM.

Lord Hunt of Chesterton: Will big projects like this be one of the ways in which we engage people in generating many more apprenticeships?

Dr Sarah Williamson: I believe so. I also believe that people go away from projects like Hinkley with a clear idea of how they want to work on future projects.

Lord Hunt of Chesterton: That is very interesting.

Q48 **Baroness Neville-Jones:** In the previous session we heard that quite a lot of integrated team building is desirable and necessary if a project is going to be successful, which rather suggests that over time you get consolidation of these teams because they will have become accustomed to working with each other.

We also heard that the advent of off-site manufacturing would provide a great opportunity for the expansion of the skills base in the factories around the country, and in effect we would be able to create greater variety and to take advantage of it. I could not entirely reconcile these two bits of evidence, because it rather suggests that there will be a great deal more ad hocery in who you choose to work with. Where do you think this is going?

Martin Kelly: You have picked up on a key point. I introduced my company as a structural steel provider and we are in a bit of a silo, but we have seen a real opportunity. Our organisations are two that you would not normally see working side by side. In a factory environment we have built the canopies for London Bridge, which are a combination of structural steel, a cladded roof and the MEP services required for the lighting. The material is craned in overnight and it is a matter of plug in and play.

That is a perfect example of what we are talking about, although it is unusual. It is unusual for us to have MEP, structural steel and cladding in the same building and working alongside one another as three separate organisations. But that is what needs to happen, and it needs to happen more widely than only two or three times. It needs to be on a much wider scale.

Baroness Neville-Jones: You say that it needs to happen. What kind of structure of the industry would be likely to provide that greater likelihood?

David Hurcomb: First, it will be as you said earlier: it will be outsiders, probably from the Far East and China, who will have developed a product that they can sell. It will be quick and safe and it will meet all the requirements of the users. I think it will go down certain product lines such as office blocks and maybe residential. That is the only way it can happen. They have worked out how to build quickly and safely in a way that meets the required building standards. That is quite likely to happen, and it will use robotics on site to do the actual building. If you go on to YouTube you can see quite a bit of R&D taking place around the world using robotics to build houses.

Baroness Neville-Jones: Can those techniques not be reshored?

David Hurcomb: We are still in the research phase rather than the development phase at the moment, but it is not unreasonable to think that in 20 years' time an awful lot of tasks will be done by robots.

Baroness Neville-Jones: Yes, but why should the UK be such a laggard? Why does it have to come via the Chinese or the Indians?

Martin Kelly: There are a few self-help options, but they require us as the industry and everyone around it.

Baroness Neville-Jones: And the client?

Martin Kelly: Yes, they are driven by the client, but we need to focus on collaborative working. I understand where David is coming from, because that is quite a big ask from where we are, but we can focus on collaborative working. A couple of contracting models are available that do that, but in practice we find that it kind of goes against the grain. The hardest bit to break is the mindset.

Lord Vallance of Tummel: I have two quick questions. If it were to come from China, do you envisage big volumetric stuff being shipped in from China, or would the manufacturing element be done here?

David Hurcomb: No. Obviously the aggregate and all the heavy stuff would arrive locally, but that is not the brains. The brains is in how all that is assembled into the finished product. The techniques would come from there.

Lord Hunt of Chesterton: Sorry, you say the techniques would come from China.

David Hurcomb: Yes.

Q49 **Lord Vallance of Tummel:** I have another point that is not entirely related. Earlier you were talking about the trade skills, but what about the other end of the skills? What about the marketing and commercial skills? To a simple onlooker like me, you have a product that looks to be cheaper, better and offers value for money, so there ought to be additional returns to the consumer. All right, there are some technical difficulties in getting there, but surely a part of all this is actually marketing the stuff. Once you have invested in plant and you have all that capital, which is now a sunk cost, how do you sell this stuff commercially to residential or other contractors?

David Hurcomb: The problem is that there is no one party in the industry that is responsible for selling the consumer the product because it is so fragmented. The client chooses a multidisciplinary team of consultants and trade contractors, so none of us is selling that sort of product. If we could have it, it would be easy to sell its benefits of speed, quality, price and so on. We are just part of the very fragmented process that comes together to build buildings in the UK.

Dr Sarah Williamson: A fully off-sited solution will not necessarily be the cheapest option. The client will be buying something else; they will be buying quality, certainty of programme and reliability in the whole-life cost.

Lord Vallance of Tummel: Value for money is a valid point.

Baroness Neville-Jones: What about performance if you produce something that works using less energy and less of this and that?

Dr Sarah Williamson: Indeed. It is about moving away from that initial capital cost to more whole-life thinking.

Lord Griffiths of Fforestfach: I am still struggling as to why this thing is not happening more quickly. The area that I know best is finance and banking. Back in the 1980s, the City of London was in a whole lot of separate silos—discount houses, commercial banks, merchant banks, many kinds of asset management companies, jobbers, brokers and so on. Today, the whole thing has come together in one. It seems to me that what held it back was regulation.

Given that there are silos, and given that you have Grenfell Tower and so on, you have to be very concerned about regulation. In the end, for a steel structurer to go into something to do with roofing, there is a risk element in trying to put it together. Secondly, in the end it was the advent of foreign competition that changed the City. In this industry, regulation is important in relation to something that is a barrier or at least something that slows down the process of integration.

Martin Kelly: It is fair to say that that does not exist currently. You are right: the reason for every silo is that it takes 20 or 30 years to be a specialist in these areas and to understand every aspect of the regulations. Moving out of that comfort zone into somebody else's sphere of expertise is hard for one organisation to do. Collaboration is the right way to do it, because trying to learn 20 or 30 years of experience is ineffective. As I say, there are not as many examples of true collaboration in the construction industry as you would imagine.

Dr Sarah Williamson: For this to work, you do not have to learn everyone else's specialism. What would make a real difference is a change in the procurement practices, with a fairer or a different sharing of risk and with practices that encourage a long-term alliancing between industry partners that have the different required skills. That is not how construction tends to be procured now.

Martin Kelly: All the component parts are there. It just requires that mindset and capability to bring them all together.

Lord Griffiths of Fforestfach: With the City of London, it was also the inflow of capital from American institutions that enabled that to happen.

Lord Vallance of Tummel: On procurement practices, are these self-imposed or are they the function of regulation?

David Hurcomb: The industry has always been very competitive. Therefore, the continual benchmarking of costs is the thing. For the Government, yes, there are rules and regulations that absolutely insist that there are three prices for the job, if you like, but frameworks in the past have been successful in driving innovation. I am thinking way back in the mists of time to the Decent Homes programme, with which I was involved. We were let seven-year contracts to upgrade the social housing. Surprise, surprise, we worked with the same people—the integrated project team that you spoke about earlier—and we got incredibly good. We drove innovation, because that was in our interests.

Where you have seen innovation in this industry, it is through large government programmes—housing or whatever—because the supply chain gets good at doing stuff and you start to see that benefit. The

problem is that as these programmes come to an end, some of that innovation gets lost. That is the shame. Government needs to trust the industry a bit more to give itself innovation targets in return for longer-term certainty frameworks to allow you to make that investment and to reap the rewards of spending a longer time as a partner.

Lord Vallance of Tummel: I can understand that, but leaving aside government procurement and just looking at the private market, what I am after is whether the regulations on procurement in that market are constraining things or whether these procurement issues ought to be dealt with by the private sector itself. Perhaps that is not happening because of the silo structure.

Martin Kelly: In my view, it is not driven by regulation, it is driven by the commercial environment in which we work. The supply chain could be 40 different trades, of which there are three to four competitive tenders for every package before you start getting to component parts. There are multiple layers of procurement. They can be done at different times and in different ways. Tier 1 might have a cost-plus type of arrangement with the ultimate client, but below him he may have five different major subcontractors all on fixed price, who below them have 15 different subcontractors procured in a different way and at different times. We talk about trying to have MEP, concrete and steel talk to one another, but often we are not even appointed at the same time.

The Chairman: I am sorry to interrupt, but we have run out of time. We have a few more questions. If you are willing, perhaps we could put those to you in writing to give you the chance to respond to them. At this juncture, we have to draw proceedings to a close. Again, I am sorry for the disruption that we had earlier due to a Division. Thank you very much indeed for coming and for giving such interesting and useful evidence.