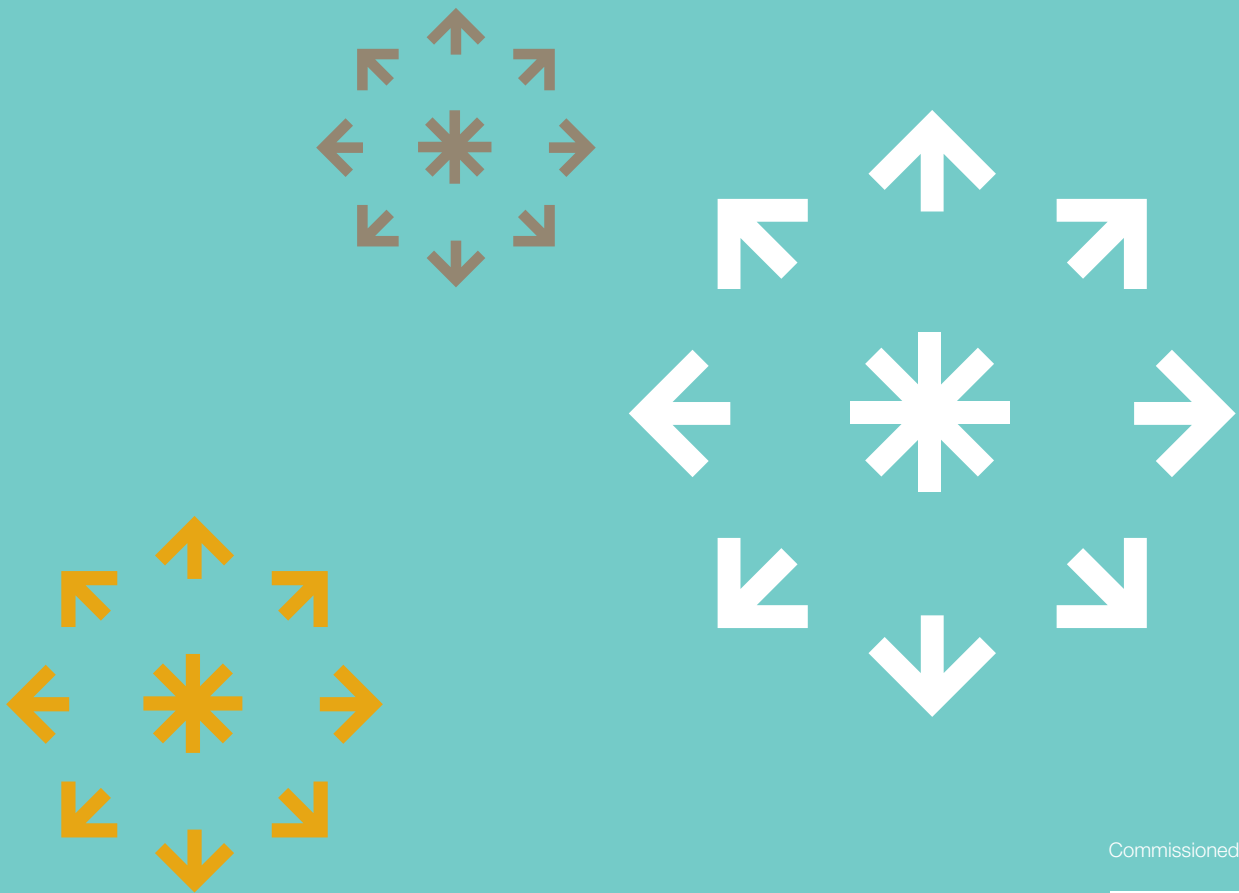


Research into Mainstreaming Offsite Modern Methods of Construction (MMC) in House Building



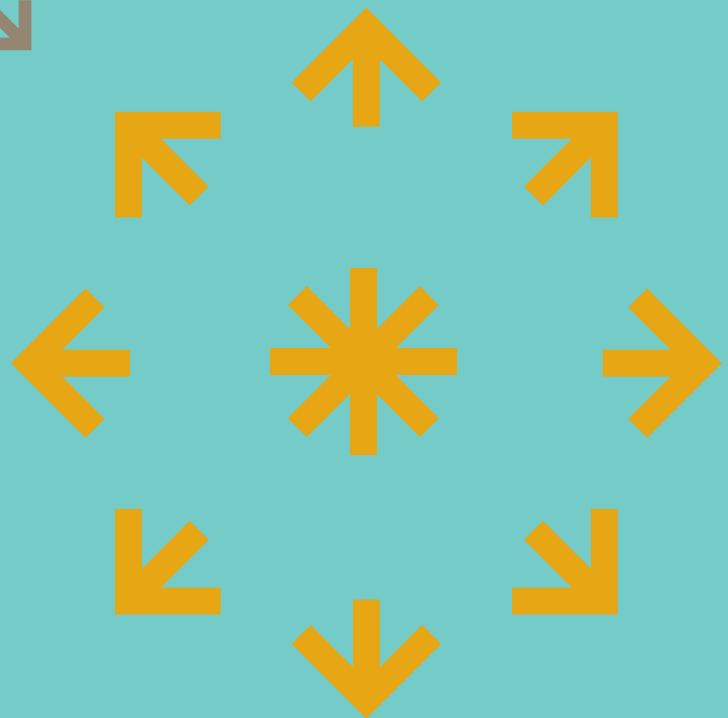
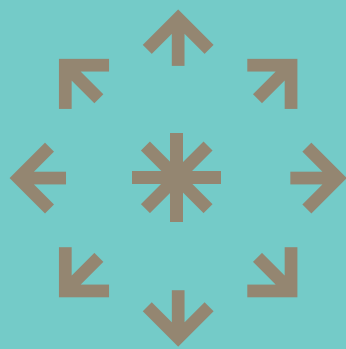
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Homes for Scotland is *the* voice of the home building industry in Scotland, representing some 200 organisations which together deliver 95% of new homes built for sale each year as well as a significant proportion of affordable housing.

We are committed to improving the quality of living in Scotland by providing this and future generations with warm, energy-efficient, sustainable homes in places people *want* to live.

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Foreword

“In Scotland’s Sustainable Housing Strategy we set out Scottish Ministers’ vision for warm, high quality, affordable, low carbon homes and a housing sector that helps to establish a successful low carbon economy across Scotland.

One of the Strategy’s key themes was transforming the market for new buildings and we want Scottish companies to maximise the potential of innovative design and construction techniques to deliver a greater number of greener homes as part of sustainable neighbourhoods and other economic opportunities.

“The Greener Homes Innovation Scheme is supporting the construction of 319 affordable homes, backed by £12.6 million of Scottish Government investment promoting greener and more modern methods of construction in the house building industry and enabling families to save up to £1,000 per year on running costs. The majority of the supported projects have now started on site and we will be looking at an evaluation of the scheme later this year.

“Scottish companies are already doing a lot of good work and we have a strong base of innovation and capability to build upon. We understand that the next step is to mainstream the techniques that have been developed, drive down costs and build the market for sustainable construction to

both enable an effective contribution towards our climate change targets and to grow export opportunities for Scottish companies.

“We are committed to encouraging companies to utilise offsite modern methods of construction due to the number of potential benefits including economic and export opportunities. That is why we commissioned Homes for Scotland to carry out this research and engage with industry to determine their level of interest in adopting these methods.

“We will work with the housing industry in Scotland to encourage them to look at these opportunities. This report from Homes for Scotland showing private house builders’ perceptions represents an important step in mainstreaming these techniques.”



Acknowledgements

Homes for Scotland (HFS) would like to thank the Scottish Government for the opportunity to undertake this interesting piece of work with our members.

We would also like to thank our well-informed and enthusiastic group of advisors who together performed the role of our project board:

Malcolm McCallie

Group Design & Technical Manager, Avant Homes and Chair of the HFS Technical Group on Building Standards & Sustainability

Alasdair Macleod

Better Homes Division, Scottish Government

Stephen Good

Chief Executive, Construction Scotland Innovation Centre (CSIC)

Calum Murray

Managing Director, CCG Homes

Dr Robert Hairstans

Head of Centre for Offsite Construction + Innovative Structures, Edinburgh Napier University

Finally, we are keen to acknowledge the time that our member companies gave to participate in the research surveys, interviews and focus group:

Survey

A&J Stephen (Builders) Ltd
Bett Homes Scotland
CCG Homes Ltd
Churchill Homes (Aberdeen) Ltd
JS Crawford Builders (RRL)
Mactaggart & Mickel Homes Ltd
Persimmon Homes (East Scotland)
Places for People
RDK/Robert Ryan
Springfield Properties Ltd
Stewart Milne Homes Central Scotland
Taylor Wimpey Ltd
Veitchi Homes Ltd

Interview

A&J Stephen (Builders) Ltd
Bancon Homes
Barratt Homes East Scotland
Bellway Homes (Ltd) Scotland
Bett Homes
CALA Homes (East) Ltd
Cruden East Scotland
Dandara Ltd
Discovery (Homes) Scotland Ltd
Mactaggart & Mickel Homes Ltd
Mansell Homes
Miller Homes
Pat Munro Homes
Persimmon Homes
Robertson Homes
Springfield Properties Ltd
Stewart Milne Homes Central Scotland
Taylor Wimpey West Scotland
Tulloch Homes

Please note that some home builders responded anonymously.

Homes for Scotland (HFS) is *the* voice of the home building industry, representing companies delivering 95% of new homes built for sale as well as a significant proportion of affordable housing.

Given its unique membership comprising some 200 home builders and associates in the supply chain, HFS has a key role to play in helping the industry to consider how it can best deliver new homes in the future.

The Scottish Government has suggested that there is a need for change within the new build market and has set out a clear challenge for the home building industry to mainstream the use of Modern Methods of Construction (MMC), believing this to be a means to increase the rate of housing supply (1).

If the new build industry is to be transformed, HFS must have a significant role in the leadership of that change, encouraging ambition and aspiration whilst ensuring this evolution is both sustainable and demand-led.

The Challenge

The Scottish Government has set out a clear challenge within the “Scottish Sustainable Housing Strategy” for a low carbon home building industry in Scotland.

Within the “New Build Market Transformation” chapter of the strategy, focus is given to the opportunities to utilise MMC as a means to deliver more sustainable homes, increase the rate of housing supply and create export opportunities supporting the drive towards a low carbon economy (1).

Historically speaking, this is not a new trend. Over the last 20 years, concerns have been raised that the construction industry as a whole has generally under-achieved in terms of its productivity and low profitability, as well as with regard to its investment in capital, Research and Development (R&D), and training (2).

Key reports have stressed the need for modernisation, emphasising the need for the industry to adopt innovative approaches to construction (2) (3).

These reports pay particular attention to the potential of offsite construction, the need to radically change existing construction processes and the need to investigate alternative business models to deliver cost and time improvements to clients, as well as increase housing supply.

The Starting Point

The use of offsite MMC must be demand-led.

There has already been a considerable amount of research into the drivers and barriers of MMC over the past decade. However, given the impact the recession has had on both the home building industry and its supply chains, the main aim of this investigation is to baseline the drivers, barriers and any resource gaps influencing home builders’ decision-making processes on the use of offsite MMC.

The exercise also seeks to explore the perception that the Scottish and UK home building industries lag behind other countries when it comes to design and innovation.

Introduction

The impact of the recession cannot be underestimated. The home building industry was significantly hit by the economic downturn that led to not only a drop in housing output but also the loss of skilled labour from the market place (4).

By 2012/13, housing starts and completions had effectively fallen by 50% and 55% respectively since 2007/08 (5). Subsequently, it has been noted that these unprecedented market conditions have seriously affected the industry's appetite and ability to take risk and make wholesale changes to tried and tested delivery models.

With private sector completions in 2013/14 having risen by 9% on the previous year due to an improved housing market, driven by consumer-led initiatives (5), the industry is now considering how it can bring forward sites and deliver much needed new homes as a result of this more positive outlook.

With concerns about the capacity of the industry to grow from such a low labour and material supply base, this is a useful time for home builders to consider how alternative construction methods could allow it to respond to the market more efficiently. This assumption is tested during the research.

It is important to recognise the progress the sector in Scotland has already made, noting that output from offsite construction in 2011/12 was around 6,000 units (6). In terms of overall housing output, that equated to approximately one third of all homes completed utilising some form of Offsite Manufacturing (OSM) (5).

"A Strategic Review of the Offsite Housing Sector in Scotland" indicates that a number of companies have entered the OSM sector over the last 12 years with its size expected to almost double over the next five years.

However, recent research by the UK Commission for Employment & Skills (UKCES) also suggests that new OSM sector entrants are discouraged from entering the market due to the extensive investment required to undertake offsite construction (7).

Research prior to the recession also indicated a willingness of many organisations within the UK home building industry to evaluate the opportunity to expand their existing OSM use (8).

It is worth noting that a number of volume home builders operating in Scotland (including Mactaggart & Mickel and Stewart Milne) have their own OSM facilities. Barratt has gone on record to highlight that labour and material bottlenecks are making MMC and OSM more appealing (9).

Given the number of companies actively involved in delivering new homes utilising MMC, as well as investing in OSM facilities, this research will consider the extent of its use and test whether this is likely to evolve.



“By 2012/13, housing starts and completions have effectively fallen by 50% and 55% respectively since 2007/8.”

Methodology

Desk Research

The starting point for HFS was to ascertain a current working and agreed definition of MMC for the purpose of this project, outlining what products and methods are included and excluded from this.

An examination of recent academic or research work surrounding the move to MMC followed, with initial findings suggesting that this has already begun: statistics are showing a good proportion of homes being delivered through OSM, a known number of home builders have set up their own facilities and published research suggests we should expect a doubling of the sector in the next five years.

Interviews

Before beginning the interviews, we undertook an online survey to assess general levels of awareness and attitudes specific to MMC in Scotland.

The online survey approach was useful at grabbing a snapshot of views across the sector and informing the basis for the interviews with a semi-structured protocol then created.

HFS represents a broad range of member companies from small family-owned builders to major UK-wide volume players. A geographically mixed sample of home builders across this spectrum was therefore engaged to ensure that different risks, obstacles and drivers were captured and to ensure that any differences between regional housing markets were considered.

The builders selected for interview were noted to collectively deliver 7,364 units for sale on an annual basis, a very high proportion of Scotland's total housing output.

The invitation to participate was sent to Managing Directors who were also encouraged to invite colleagues involved in decision-making processes concerning construction methodologies to accompany them. This group interview approach meant there was a discussion between colleagues as well as with the interviewer, all of which was captured.

Focus Group

A summary of the findings and draft recommendations stemming from the interviews was shared with a focus group of seven builders. This round table discussion was helpful in testing the research findings and building upon the actions required.

The Audience

This report is directed at all those who have a commercial or policy interest in the use of offsite MMC in the delivery of new homes in Scotland.

The intended audience spans a range of professions and backgrounds from politicians to local authority planners and the supply chain. We believe it will be of particular interest to home builders and offsite manufacturers.

It is expected that some readers may find parts of the report sets out material which is (to them) perfectly obvious, or feel that it unduly simplifies matters with which they are already familiar.

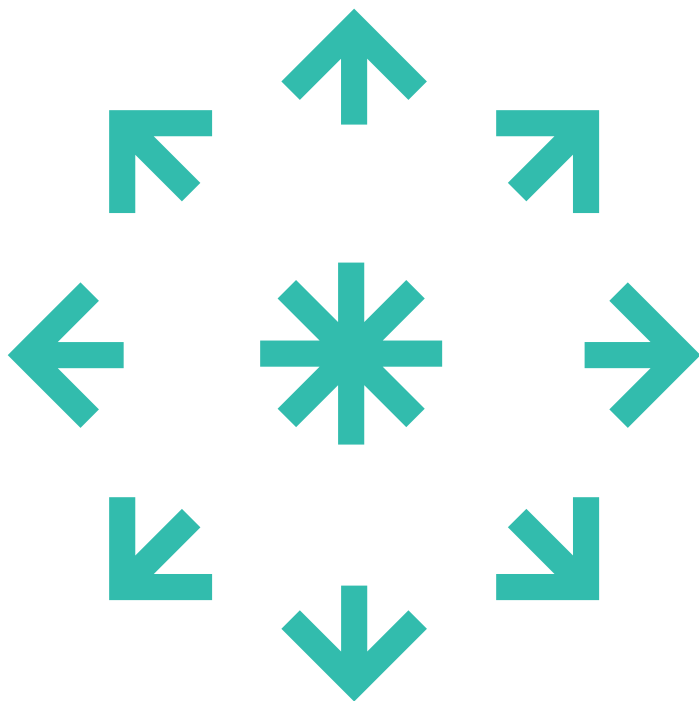
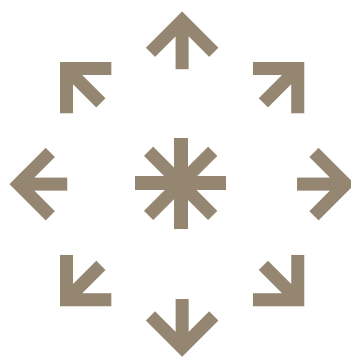
Our goal, however, is to provide information to enable readers from all starting points to understand the key issues and perspectives of home builders.

Whilst a number of the issues are not new, the objective of this report is to provide a documented baseline - a resource which, up until now, has not been available.



Findings





Definition

It was clear from the beginning that there is some debate surrounding the definition of what constitutes a “modern method of construction”.

Early research highlighted the lack of a universally agreed definition, causing significant misunderstanding amongst the various stakeholders.

Existing definitions can be simplified into two main premises: MMC in terms of product and MMC in terms of process.

Interestingly, it was noted that home builders, lenders and warranty providers view MMC as the former, predominantly deriving an understanding from Housing Corporation’s construction classification system:

- Offsite Manufactured – Volumetric
- Offsite Manufactured – Panellised
- Offsite Manufactured – Hybrid
- Offsite Manufactured – Sub-assemblies and components
- Non-Offsite Manufactured MMC

Contrary to this view, MMC has also been interpreted as a broader concept than a particular focus on product, rather seeking improvements through better processes in the delivery and performance of construction (Barker 33 Cross Industry Group, 2006). Indeed, whilst a product based definition appears simple, it would imply that all products categorised above are indeed ‘modern’ methods of construction.

It was highly debated whether the term “MMC” should be used, given that it was common for various stakeholders to use the term MMC interchangeably with offsite construction. It was therefore vital for the purpose of this research that an agreed working definition was used.

Given the various interpretations available, it was agreed that the term MMC did not accurately reflect the purpose of this work, which places a primary focus on offsite manufacturing. For that reason, MMC and offsite construction are separated into two distinct elements.

For the purpose of this research, working definitions of MMC and offsite construction were derived from the Offsite Housing Review (3).

Modern Methods of Construction refers to:

“ Modern methods of construction (MMC), is a term used to encompass a range of processes that a builder can undertake to meet planned, measurable benefits in time, cost, quality, and sustainability.”

Offsite Construction refers to:

“ Offsite construction is an approach to construction process, where the construction value added offsite is more than 60% of the final construction value at completion.”

Examples of offsite construction include those outlined by Housing Corporation’s construction classification system noted above.

Key to this definition is the separation of process and product i.e. not all offsite is MMC and not all MMC is offsite. Whilst a working definition was developed for the purpose of this research, to avoid future misinterpretation of MMC and offsite construction, a universally accepted definition of each is required.

Online Survey

To initiate this research, home builders were surveyed in order to gain an understanding of existing use and awareness, drivers, barriers and perceptions to using offsite construction. The results of this survey would be utilised to inform the format and questioning for the interview stage.

The survey was conducted online between October and November 2014, receiving 27 responses from a range of HFS members.

Analysis indicates that the survey responses received represented companies delivering approximately 43% of new homes built for sale in Scotland.

Some responses are omitted from this figure: two from non-home builders and ten from companies wishing to remain anonymous.

Use of Offsite Construction

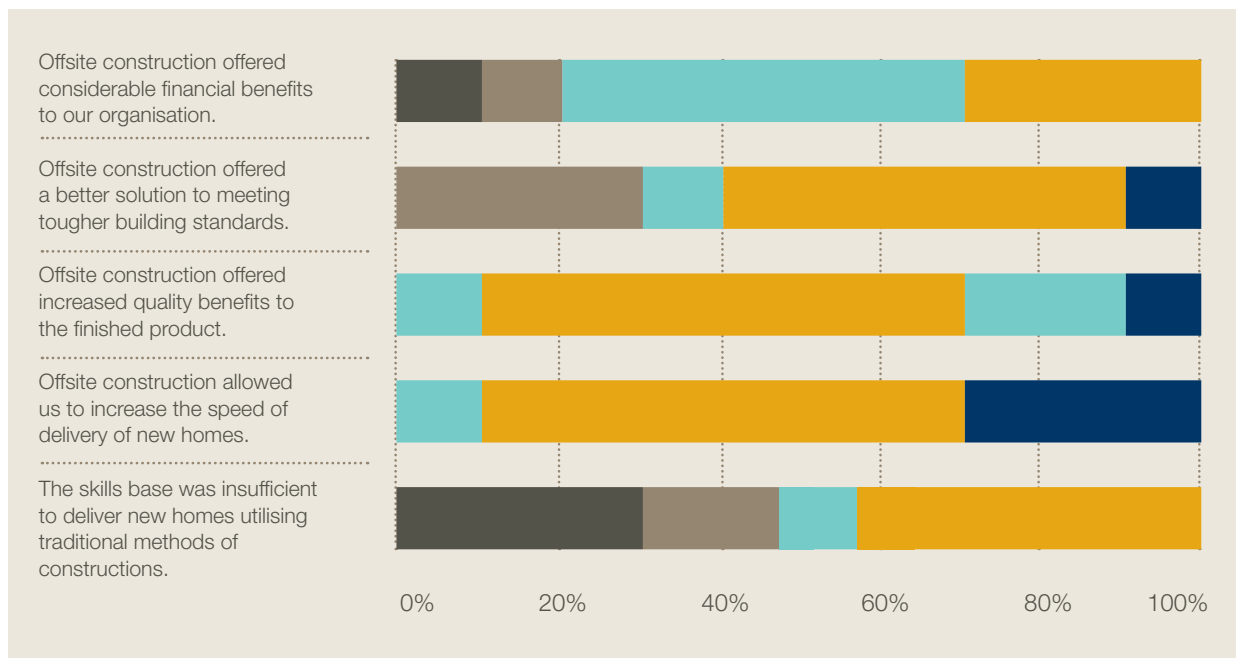
Of those who responded to the survey, 52% indicated use of offsite construction to deliver homes for private sale.

Drivers to the use of offsite construction as identified within the literature review were tested with this group of respondents. As shown in the charts below, speed of delivery was indicated as a key benefit of its use.

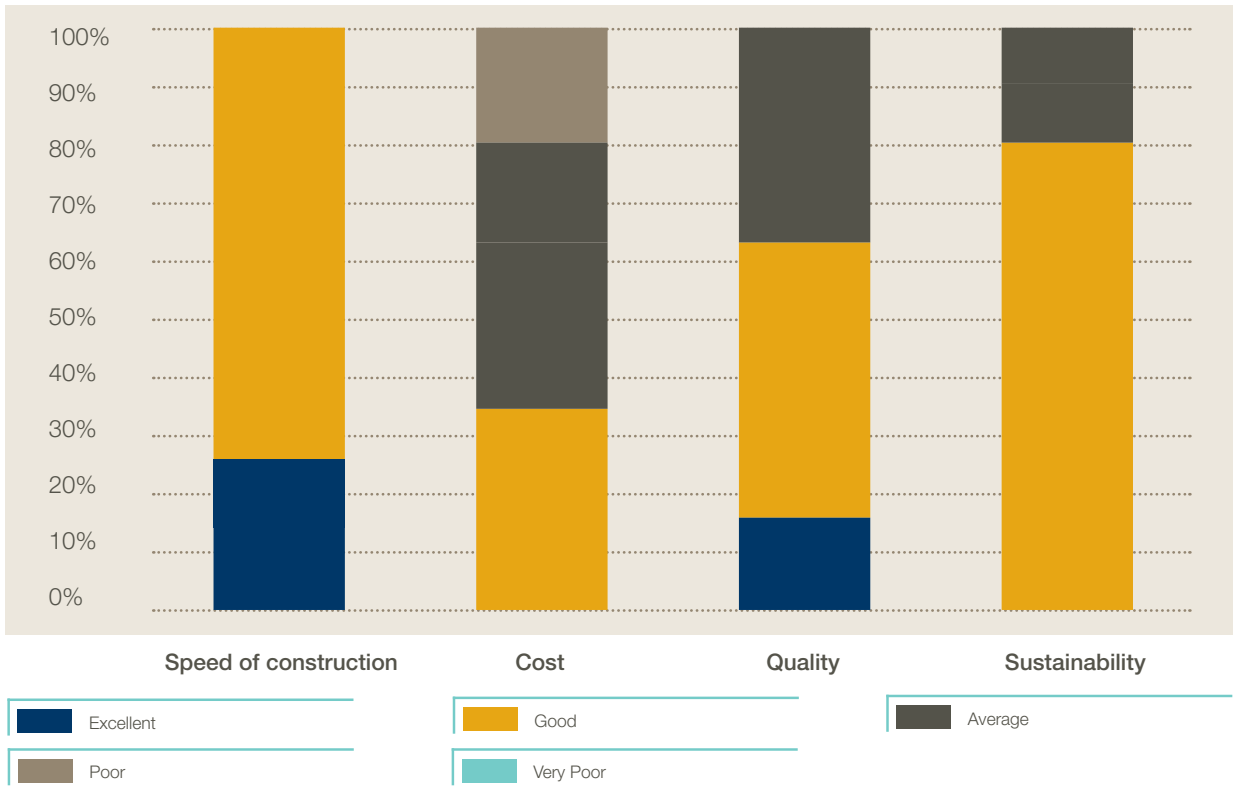
It was also noted that offsite construction offered quality benefits and a better solution to meeting tougher building standards.

Responses were divided in assessing skills and financial drivers to the use of offsite. Of the key benefits in terms of Time, Cost, Quality and Sustainability, respondents identified Cost benefits as being mainly poor to negligible.

How strongly would you agree with the following statements as drivers towards your adoption of offsite approaches to construction?



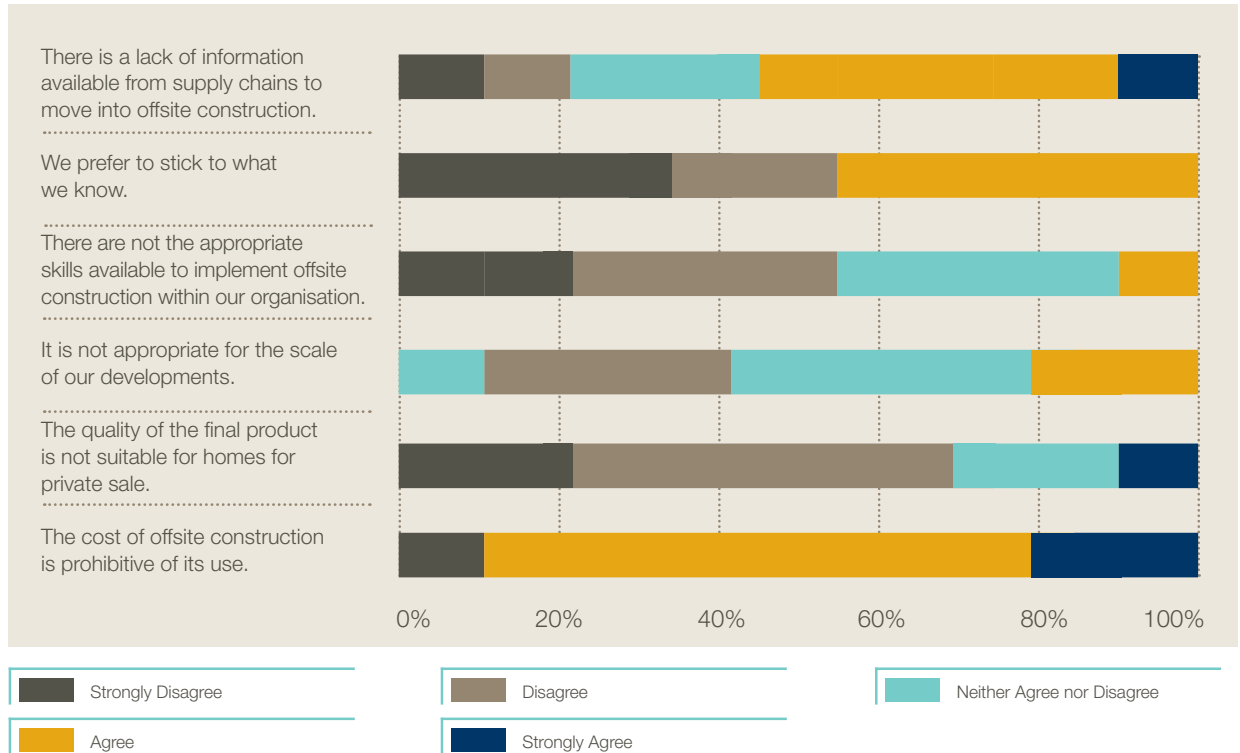
How would you rate the benefits of offsite construction compared to traditional methods of construction?



Not Using Offsite

Of those who indicated they did not use offsite construction for the delivery of homes for private sale, key barriers were identified, specifically cost and a lack of information from the supply chain.

How strongly would you agree with the following statements as barriers toward your adoption of offsite construction?



The Future of Offsite

Interestingly, the majority of respondents indicated their organisations were investigating moving to or expanding existing use of offsite construction in the future.

Commonly, panellised systems were indicated as the preferred route to offsite construction, with many noting skilled labour availability and quality control as reasons for further investigating its use within their written responses.

In summary, the results of the online survey appeared to be optimistic regarding the use of offsite construction. However it suggested that costs, skills and supply chain information would require further investigation within the face-to-face interviews.

It should be noted that the survey results were used to inform the discussions at face-to-face interviews, and not the selection of organisations interviewed. A range of companies were selected for interview, of which one third had responded to the survey.

Business Models

A crucial part of this work has been understanding the various business models active within the home building industry and how they influence the use of offsite construction.

A valuable outcome of this research will therefore be a shared understanding of how different home builders operate and how policy-makers and the supply chain can distinguish between the different models in their actions. It would be unhelpful to continue to think of the “industry” as one, where the drivers, barriers and support required with regard to offsite construction are being considered.

Home Building Companies

Each of the home builders interviewed are builders who build homes for sale. Interviews were not held with those operating a contractor only model i.e. delivering homes on behalf of another party.

Some of the companies interviewed had a contracting division within their wider group but the focus of discussions was on the homes for sale part of the business.

This distinction was important as it was the home builder that was taking on the sales risk to ensure a return, unlike a contractor delivering homes with a guaranteed exit.

In addition, however, where home builders also acted as a contractor for the delivery of affordable homes, information on differences in approach were noted.

Size Doesn't Matter

Interviews were held with builders of a range of sizes, currently delivering between 15 and 1,500 units per annum in Scotland.

In total, the sample builders were delivering around 7,364 units on an annual basis and most were aspiring for growth.

Whilst it was important to test the questions with such a range, the findings did not show any correlation between the number of units being delivered by the company and the awareness, use of or attitudes to offsite construction. Where there were subtle differences, these are noted clearly within the main findings.

Scotland or UK Headquarters

Eight of the 19 companies interviewed had head offices based in England with operations across the UK.

Whilst there were some differences on the decision-making autonomy devolved from the UK group to Scotland to the regions (with, for example, one company taking a decision on construction based on the bids received from contractors for each project), in the main the UK group had an influence over the approach to construction.

The remaining 11 companies had head offices in Scotland and the local decision-making power was shown to have a slight, but not significant, bearing on attitudes to an evolution towards offsite construction. The findings in relation to company attitudes and perceptions are particularly interesting in that regard.

Construction and Timber Frame Divisions

Each of the companies with head offices in England used both external construction companies and external timber frame suppliers.

Whilst some of these companies had begun to employ some trades directly in response to current skills shortages, the overall majority of construction work was contracted out to sub-contractors.

Of the companies with Scottish headquarters, eight of them had their own in-house construction teams, with four of the same eight also having their own timber frame divisions.

One company had its own timber frame division which the homes business utilised, but interestingly the same company also had a construction arm within the group which was not used for the homes for sale business.

Only two of the companies with an internal timber frame division had the capability to offer offsite options (i.e. closed panel systems as opposed to the commonly used open panels). The final Scottish company contracted out both construction and the supply of timber frames.

Whether the companies had their own construction teams and timber frame divisions had a clear bearing on considerations to the approach to construction including the programming of work, the utilisation of existing resources (people and production lines), additional investment required in training/premises and the management of a transition period.

Interestingly, the provision of a timber arm, even one with offsite capabilities, did not necessarily mean the company was closer to the use of offsite construction for the delivery of all its homes for sale.

Five Models

Work has been undertaken to define the home building companies engaged in this work into five models based on as follows:

Model 1 – Companies headquartered in Scotland that have their own construction division and also have a timber frame division. Companies in this model were in total delivering around 894 units per annum.

Model 2 – Companies headquartered in Scotland that have a timber frame division but use external construction contractors. Companies in this model were in total delivering around 174 units per annum.

Model 3 – Companies headquartered in Scotland that have their own construction divisions but do not have a timber frame division. Companies in this model were in total delivering around 432 units per annum.

Model 4 – Companies headquartered in Scotland that use external construction contractors and external timber frame companies. Companies in this model were in total delivering around 15 units per annum.

Model 5 – Companies headquartered in England that operate across the UK and use external construction contractors and external timber frame companies. Companies in this model were in total delivering around 5,849 units per annum.

	HQ Scotland	HQ England	Own Construction Division	Own Timber Frame Division	Annual Volume Output
Model 1	X		X	X	894
Model 2	X			X	174
Model 3	X		X		432
Model 4	X				15
Model 5		X			5,849
				Total	7,364

Construction Methodology

Home builders were asked to disclose their construction methodologies and discuss offsite construction with regard to the agreed working definition:

“An approach to construction process where the construction value added offsite is more than 60% of the final construction value at completion.”

Given the above description, the majority of interviewees indicated that while they believed they utilised offsite construction, they doubted it accounted for the 60% of final construction value implied by the Offsite Housing Review.

Construction methodologies typically consisted of “hybrid” systems, utilising pre-manufactured timber kit systems (including open panel), with a range of offsite prefabricated components such as floor and roof cassettes, and prefinished elements such as windows, canopies and door sets.

Investigation of the decision-making process with regard to construction methodologies revealed a number of notable themes that ran across the business models outlined above.

The Shift to Masonry

A common trend identified within builders in Model 5 was the shift to traditional masonry construction during the height of the recession, aligning decisions regarding construction methodology with their respective UK headquarters.

The key reason given for this approach was to provide flexibility within construction programmes to suit the uncertainty of market conditions. Since then, six of these companies have subsequently switched back fully to timber frame construction, following the approval of regional business cases to deviate from common group headquarter construction methodologies.

Interestingly, it was noted by these companies that the switch back to timber frame was, when comparing costs on a “like for like” basis, on average, £1000 to £2000 per unit more expensive. These companies noted that, in some cases, they knowingly paid more in upfront costs to revert to timber frame construction as a reaction to limited labour and material availability impacting the delivery of new homes, as well as the clear additional benefits in terms of construction quality and time on offer.

Two Model 5 companies noted their continued use of traditional masonry construction as part of their construction mix.

One of these companies recorded that the need for new management to be able to assess the business on a UK-wide basis, comparing “apples with apples”, has resulted in the prolonged use of masonry construction methodology. While it was preferable for this company to transition back to timber frame, a quick shift was unlikely. The other company interviewed was actively transitioning back to timber frame construction, however, decisions on construction methodology would continue to be taken on a site by site basis.

It was often noted by Model 5 companies that the use of masonry construction offered greater flexibility during the downturn, for example, being able to respond to consumer demand, planning and getting started on site quickly. In contrast, whilst the benefits of timber frame were noted, additional lead-in times were noted as a barrier to being able to react quickly to changes in market conditions.

The All-Rounders

It was common to find that home builders with their own timber kit divisions (Models 1 and 2) procure timber frames internally for the delivery of homes for sale.

Interestingly, all but one of these divisions supply timber frames to external clients in addition to their own homes divisions. Of these organisations, two expressed capacity to deliver more advanced offsite systems i.e. closed panel systems, however, it was understood that, for commercial reasons, these systems were not utilised by their own homes divisions.

It was noted that home builders believed that offsite systems were often seen as a business opportunity for their timber kit divisions. However, it was noted by one in-house supplier that there was limited external and internal demand for these systems.

Other Models

For one of the companies identified within business Model 5, it was understood that the final construction methodology was based simply on the results of the tendering process and which tender offered the best value to the home builder. Whilst this company provided a design specification, the specific use of offsite construction was not prescribed.

It was also drawn out from the interviews that two companies are currently pro-active in their investigation of offsite construction.

One company from Model 4 noted its transition to offsite construction as stemming from the need to rethink how homes are constructed and how to reduce the waste and inefficiencies inherent within the traditional construction model.

The other Model 2 company chose to experiment with offsite construction on a couple of sites in order to better understand its capabilities and what benefits can be drawn from its use. Interestingly, this company noted that its own timber kit production division was not sophisticated enough to deliver closed panel systems and thus used an external OSM supplier for its investigation.

Affordable Housing Delivery

Only one company noted the use of offsite systems for the delivery of affordable housing, as specified by the partnering housing association.

It was commonly expressed that while local authorities and housing associations intended to promote the use of offsite construction with their specification, it was often reconsidered when the costs became clear. In particular, it was understood that the range of design specification requirements for affordable housing made it difficult to achieve benefits in terms of the economies of scale achieved in delivering standardised products.

Flexibility

Drawing from comments during interviews, it would appear to be correct to suggest that, as home builders, local authorities and housing associations maintain different design specification of product, open panel timber systems currently provide the greatest flexibility during production to meet the needs of clients.

Drivers & Barriers

Initial findings from the online survey suggested a range of drivers and barriers to the use of offsite construction.

It was commonly noted that the lack of an adequate business case poses a real barrier to the adoption of offsite construction (10).

Despite these concerns, use of OSM in housing has increased during the last ten years with research suggesting that around 6000 units were constructed utilising offsite construction in Scotland in 2011/12 (6).

Given the suggestion by the Construction Industry Council that the most significant group to utilise offsite construction is Registered Social Landlords (RSLs) investing resources in social housing for rent, it is likely that a substantial proportion of the 5,257 units delivered by the public sector in 2011 utilised some form of OSM (5).

Whilst, as noted above, offsite construction is likely to be used for the delivery of affordable housing, it should be remembered that this report focuses on homes for private sale. The drivers and barriers investigated in this research have been put into the context of the business case and the core controls that support the justification of decision making; time, cost, quality and sustainability.

Time

Construction Programming

Previous reports and studies note “speed of delivery” as a key driver to the use of offsite construction in home building. However, research indicated fundamental differences between the delivery models of homes for private sale and affordable homes delivered for RSLs and local authority clients.

Interviews across all business Models identified that, unlike the delivery of affordable housing, there is no guaranteed “exit”, as in certainty of sale/completion and handover within the private housing market. Companies went on to note that “speed of delivery” was only of benefit where there is market demand and a sustainable housing market. Given there is no certainty of a buyer, greater flexibility of construction programmes is required in delivering homes for sale. “Speed of delivery” was not, therefore, seen as a major driver to the use of offsite construction.

Positively, companies also noted that, given a sustainable housing market and predictable demand, offsite construction could offer greater consistency and control of construction programmes, reducing associated risks of non-productive hours/days caused by climate and weather challenges in Scotland.

In addition, some companies noted that phasing construction strategically could negate the risks associated with speculative development, whilst also enhancing street scenes earlier in the construction programme, making developments more attractive and marketable.

In the short-term, concerns were raised by home builders in Models 3 to 5 surrounding the capacity of the supply chain to respond to increased demand for OSM and the impact this would have upon construction programming.

Lead-in Times & Design Freeze

Companies across business Models 1, 3 and 5 raised concerns regarding the impact offsite construction would have on lead-in times. It was believed that increased add-ons at this stage of development would both lengthen the time it would take to get to site and affect their ability to respond to fluctuations in market activity or increases and decreases in housing demand.

Significantly, it was noted by some companies within business Models 1 and 5 that greater use of offsite construction would impact their ability to offer customer alteration packages, requiring an earlier design freeze for customers looking for bespoke packages.

Cost

Cash Flow

All companies interviewed expressed concern with regard to the vastly different cash flow models that would be required in moving to offsite construction, core to this being the shift to upfront costs and the impact this would have upon lending.

Existing cash flow models were noted as being aligned with the need for flexible construction programming due to inherent uncertainty in the housing market.

It was felt that a shift to upfront costs, without a guaranteed sale, would inevitably result in companies taking on additional financial risk during development.

Additionally, it was believed that the impact upon lending criteria might significantly impact SME companies and would require greater education of the lending community of the benefits of offsite construction.

Linking back to the business case, it was noted that this would have less of an impact when delivering for affordable housing, where a guaranteed exit exists. Despite recent market optimism, uncertainty within the housing market was identified by home builders as a key risk.

“ Existing cash flow models were noted as being aligned with the need for flexible construction programming due to inherent uncertainty in the housing market.”

Costing

When questioned, interviewees across all business models perceived offsite construction to be more expensive than their existing construction methodologies.

Interestingly, this view is predominantly based on basic comparisons of construction methodologies: “apples with apples”.

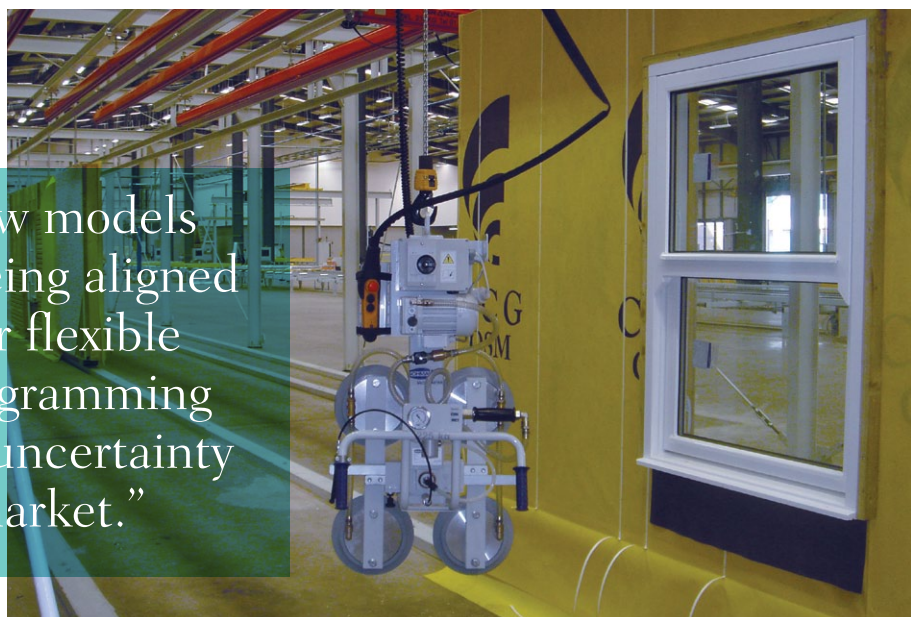
Every builder confirmed that detailed whole-life cost analysis (in the case of home builders, from inception to hand-over and the end of warranty periods) had not been undertaken.

Historical studies of offsite systems were predominantly used as the basis for these calculations. However, while some home builders seemed to understand the added value/benefits that may arise from initial additional costs, for many there was a lack of available information to make a detailed business case for its use. This may also reflect the availability of R&D resources within the industry to conduct this analysis.

Procurement

It was common that companies identified within Model 5 felt that using OSM supply chains would result in them missing out on the efficiencies of “group deals” that those with UK buying power have.

It was understood that these companies believed that they would be unable to utilise products currently procured on “group deals” such as windows and insulation in place of using full systems with all components procured through the supply chain. It was perceived that the supply chain would be unable to achieve the economies of scale acquired by group procurement.



Quality

Build Quality

All companies interviewed agreed that offsite construction could provide a greater quality in the final product delivered to site.

Specifically, it was understood that constructing components in controlled environments could help reduce snagging and help further improve customer satisfaction levels across the industry.

It was further highlighted that it would have the potential to reduce the number of reportable items that are tracked closely by warranty bodies, something that the home building industry takes very seriously.

Additionally, a few companies indicated that a shift to offsite construction would likely reduce the amount of control and supervision over the final quality of the product, with supply chains taking on this risk. This may also have implications in terms of responsibilities where issues arise post- construction during warranty periods.

Companies operating at the higher end of the market also raised some concerns regarding the customer perception of quality for higher specification builds.

Interestingly, this was also a perspective shared by a company operating in a rural setting, where it was believed that customers may make the distinction between construction methodologies if offsite has predominantly been used for affordable tenures.

Skills

Skills were identified within the early research as being both a driver and a barrier towards the greater use of offsite construction.

It has been widely noted that the home building industry in Scotland faces a skills shortage (11) (4). Skill shortages in the construction sector, generally, are not uncommon and have played a significant role in the decrease in annual housing supply over the last 20 years (2) (10) (12).

This corresponds with the views of all home builders interviewed. The lack of traditional skills was seen as a key driver toward the consideration of offsite construction. All companies expressed their concerns regarding the lack of an adequately skilled labour force in Scotland, which often resulted in higher costs for traditional trades on site.

Prior research has commonly noted the key driver for moving to offsite construction is the offer of greater efficiencies in the use of labour throughout the lifespan of a project, resulting in a reduced requirement for traditional onsite labour (7).

Home builders agree with the views of the UKCES which notes that the uptake of offsite construction within this sector may have the potential to entice new entrants and thus a greater diversity of recruits into the industry due to more favourable working conditions.

For example, it was noted that fabrication teams would be working in cleaner, safer, indoor working environments and that erection teams could spend less time out on site due to accelerated construction programmes.

It was also believed that this could help alleviate the rising costs of labour in Scotland. However, a few builders were sceptical as to whether reduced labour costs, as a result of having less-skilled operatives, would be passed onto home builders procuring timber systems from advanced suppliers.

Companies also highlighted that there are potential issues developing new multi-skilled workforces, particularly through existing traditional training structures. Whilst some companies noted that offsite construction would need less skilled operatives in comparison to traditional trades, two Model 1 companies indicated that shifting to offsite construction would require significant training investment to obtain the appropriate technical and managerial skills within their organisation, a theme expressed within UKCES research (7).

It was clear that a shift to offsite construction would require a radical change to the way skills are developed within the industry which would have an impact on the delivery of traditional trade apprenticeships and possibly cause some friction with some trade bodies and unions who may see this as deskilling the construction industry.

Inevitably, it was noted by some companies that a transitional period would be required to allow for the development of new skills.

Health & Safety

A few companies within business models 3 and 5 indicated that they believed offsite construction would bring additional benefits in terms of reducing associated health and safety risks within the industry.

The use of closed panel systems in particular was often used as an example that would support this onsite, through designing out associated risks during the course of the design process such as reducing the need for scaffolding and manual lifting.

Aesthetic & Design

Companies across business models (1, 3 and 5) offering substantial customisation opportunities for customers raised particular concerns with regard to the adoption of offsite construction.

For these companies, it was noted that greater flexibility of design and structure was required to provide customers with the choices offered within their sales programmes. Typically it was reported that standardisation often inhibited the flexibility of bespoke design packages.

It was understood that some builders believed that it would be challenging to redesign standard house types, currently optimised for masonry construction, to efficiently suit offsite systems. It was often expressed by interviewees that their organisation lacked in-house R&D resource to undertake such work following the loss of skills during the recession with one builder noting particular issues in optimising standard house types to timber frame without the use of additional steel support structures.

Many interviewees highlighted the benefits that open panel systems currently offer regarding the flexibility to meet varying designs and specifications of client needs.

It was believed that advanced offsite construction would require home builders to achieve a greater amount of standardisation of product.

Concerns regarding this were raised by a few companies. Given material palette constraints imposed by Local Authorities, greater use of offsite may make it more difficult to differentiate between company products, especially where local planners are more restrictive of façade treatments, preferring use of traditional finishes that lend themselves to more conventional construction methodologies.

Sustainability

Building Standards

Generally, companies across all business models felt that building standards would drive the industry to evaluate offsite construction.

A core element of this belief was that increasing airtightness standards would become a key challenge for the industry in meeting enhanced energy standards.

Whilst it was felt that the 2015 Energy Standards would not be a strong driver for change, with early indications from beta Standard Assessment Procedure (SAP) calculations pointing towards Photovoltaic (PV) as the most economical solution, the yet to be defined challenge of the 2019/2020 pursuit of zero carbon homes was expected to lead the industry to seek alternative build approaches.

Furthermore, the focus on reducing the “as designed v as built” performance gap was believed to be a driver towards giving greater consideration of quality throughout the construction process.

Efficiency

It was agreed by all companies interviewed that a shift to offsite construction would benefit both the productivity and efficiency of the industry in the longer-term.

It was indicated by a few companies that a key driver towards their adoption of offsite construction was to gain productivity and reduce inefficiency and waste that was inherent within traditional construction methodology.

Other

Warranty Providers

It was felt that lenders, insurers and warranty providers lack confidence in the newer technologies available to the industry (4). Early research highlighted the importance of considering the longer-term interests of stakeholders once a home has been completed but quantitative evidence as to the performance of such systems is currently unavailable to address these concerns.


During the interviews, a few smaller home builders within Models 3 and 4 noted the difficulties obtaining verification and certification of offsite construction from warranty providers which also impact the choice of lenders from which consumers could obtain mortgages.

Transportation & Logistics

Interviews highlighted the common practice for companies to utilise a number of timber kit suppliers to reduce risks with regard to geographic coverage as well as capacity.

Home builders commonly noted the limited availability of OSM capability amongst the supply chain, which highlighted the logistical issues in transporting systems from trusted suppliers to other regions throughout Scotland.

For one Model 5 company, it was noted that, despite having its own timber kit manufacturing facility south of the border, transportation and logistics issues mean it does not utilise this facility, instead relying on local supply chains.



“If a competitor started doing it, it would make us curious but we would not necessarily follow.”

Attitudes & Perceptions

Companies

The attitudes of companies towards offsite construction were tested during the interviews.

All Else Being Equal

The attitudes were generally very positive, with each company able to list the perceived benefits of its use.

No resistance to the principle of offsite construction methods was noted from anyone. In fact, the findings suggest that, all else being equal, builders across each of the five business models would be keen to adopt offsite construction methods.

However, the most commonly held perception was that offsite construction is more expensive. Whilst builders appreciated the added value that offsite construction could bring and, interestingly, confirmed that no detailed cost analysis had yet been undertaken, mindsets fixated on higher costs in themselves will be a challenge to change. In builders' minds, the added costs will prevent all else being equal.

Pack Followers, Not Leaders

One observation during the interviews was the high level of interest from home builders on what others were doing, with a number stressing that they were "pack followers, not leaders". This view was most commonly held amongst Model 5 companies.

Despite two Model 1 companies having vested interests in offsite capabilities within their timber frame arms, it did not seem that there was any sense of drive for first mover advantage from the homes for sale businesses.

"We are not great trailblazers, we prefer to stick to tried and tested methods. If volume home builders did it we're likely to pay closer attention. We'd feel obliged."
(Model 2 company)

"If a competitor started doing it, it would make us curious but we would not necessarily follow."
(Model 5 company)

It is important to point out, however, that there had been some innovation on a small scale (such as for show homes) but experimental construction at scale was far more unlikely.

Innovation, Research & Development

It was clear from the interviews that very few companies had the advantage of having someone specifically responsible for R&D.

During the downturn, such budgets had been cut and, for one company, the responsibility for innovation had been left as an additional task on top of what generally fell to Technical Directors.

The interview findings show that with efforts focused on delivery of the job in hand, very little time was spare to consider new ways of constructing.

For Model 5 companies, where a budget is available, the R&D is led in England. In Scotland investment in R&D was most common amongst Model 1 companies, with a particular emphasis on those who had invested in offsite capabilities within their timber arms. A few companies across model types had set up working groups on sustainability which included offsite construction within the remit.

"Pre-recession we had people employed dedicated to R&D. We have no-one now. Home builders are not good at R&D. We have not moved forward in how we do things for the past 20/30 years."
(Model 5 company)

"Home builders are running tight ships, we are so lean and not confident enough to take people on to look at this. The design and commercial resource is not there to see this through."
(Model 5 company)

Decision-making

The different levels of decision-making amongst the five models impacted attitudes to offsite construction.

For Models 1 to 4, with Scottish headquarters, it was clear that if there was the desire and it made economic and practical sense to use offsite for a specific project, then they would have the autonomy to go ahead.

Interestingly, whilst there is internal pressure on the two companies within Model 1 to utilise the offsite capabilities on offer from their timber frame arms, the homes for sale businesses have the authority to decide what is best for their part of the business. On nearly every project discussed, the commercial decision taken by the homes businesses was not to utilise offsite construction.

There were clear differences noted amongst Model 5 companies with regard to decision-making. It was clear that some would have a very difficult selling job persuading their English head offices that they should change to offsite methods, indeed the findings show that it was a difficult task to persuade their group to move from traditional build to timber frame given the extra costs involved and the pre-occupation with traditional construction in England. For these companies, it seems the journey towards offsite could be longer than others.

Some Model 5 companies held similar authority to companies headquartered in Scotland, with the opportunity to test different methods on a project by project basis. Furthermore, for one Model 5 company, the decision was based simply on the results of the tendering process and which sub-contractor was offering best value, regardless of the construction method proposed.

Capacity and Control

A concern raised by a number of home builders was the capacity of the supply chain to meet demand if more home builders went down the offsite construction route.

This concern was most commonly held amongst Model 5 home builders, specifically those delivering a high volume of output.

The results of the Edinburgh Napier University study suggesting there was capacity to incorporate offsite systems within up to 16,000 homes was shared in response, and this surprised home builders. Suspicion remained over the time it would take to increase capacity i.e. how quickly companies could introduce a double shift pattern.

There was a fear that too much reliance on offsite suppliers would mean reduced control by home building businesses themselves.

Some builders were so nervous about not having that control over programming that they would consider establishing their own plant to guarantee production.

It was found that this fear stemmed from experience with timber frame suppliers where competition from other home builders had lengthened lead-in times and knocked programmes off track.

Some builders explained that they deliberately contract multiple timber frame suppliers to ensure that “not all their eggs are in one basket”.

Furthermore, concern was expressed about the price of supply if interest in offsite was to increase. It was feared that, without enough competition among suppliers, there may be a monopoly on costs.

On different terms, there was also a perception that offsite would only work in confident markets where demand is high.

Many companies had switched from timber frame to traditional build during the downturn to allow them to turn the tap “on and off” when required.

There is a perception that offsite construction (as well as open panel timber frame construction) requires forward commitment at scale, forcing builders to build speculatively with the order preceding house sales.

Evolution

The feeling from the home builders interviewed is that a move to offsite should be considered an evolution and that an overnight change should therefore not be expected.

The desire of home builders to explore alternative construction methods is clear but there is a long way to go and the distance left to travel varies amongst the five models.

“The Government need to consider carefully any push towards offsite. Think of it as turning an oil tanker. We need a slow evolution, don’t force it.” (Model 1 builder)

As part of this evolution, there was a strong feeling that the transitional period would be difficult to manage with one of the stated reasons being the cost of some trades still being required onsite. For example, a joiner’s onsite workload may be reduced but if they are being booked in, it is likely that they will still be required to be paid for a full day’s work.

A concern was also raised about the mix of trades onsite and offsite - the willingness of an electrician onsite to connect and certify electrics fitted offsite for example.

Furthermore, all builders interviewed (with the exception of one) directly employ site managers and a concern was raised about the future of their role. Whilst their responsibilities may lessen, allowing them to manage multiple sites and therefore reduce site costs, in the transition it is likely that they will remain a full cost to the business.

It was clear that builders interviewed would not know at this stage how to account for changing costs during a transition.

Customers (Home Buyers/Owners/ Occupiers)

The literature review undertaken to inform this research stated that there are some negative perceptions of innovative construction held by many consumers (4).

It was felt that purchasers have no way to directly influence the design and construction of new homes, and no voice to articulate any views on the merits or demerits of construction methods (3).

The literature also raised concerns that consumer perceptions could be drawn from historical examples of innovative construction systems that have spectacularly failed, in the case of Ronan Point in 1968 or from examples of poor performance of some post-war prefabricated buildings.

These views were tested through the interviews which addressed home builders’ views on the perception of their customers which were that customer interests lie in the completed product where they expect a high quality of finish and have trust that the home builder will deliver this. The exception to this was customers with a technical background who took a closer interest in the build.

“Our customers don’t care what’s behind the plaster board.”
(Model 1 builder)

“Customers don’t care how the home is constructed – it simply doesn’t feature on the radar.”
(Model 2 builder)

“Customers buy a house – doesn’t care if bricks, blocks or whatever.”
(Model 5 builder)

There are sustained high levels of customer satisfaction in Scotland and this remains extremely important to home builders.

Slight concern was expressed by some builders about whether customers could consider homes built offsite as being of lesser quality. This was most notable from builders delivering a higher end home who believed that their customers expect a more solid home and to be able to “kick a ball off the wall” (Model 1 builder). There is also a close eye on potential resale value.

Whilst there were no significant differences between the five models in terms of their views on the perception of their customers, an interesting rural dimension was found with one company interviewed reporting that it did not need to market its homes and instead received customer enquiries when the construction onsite commenced. It had a strongly held belief that these customers like to see the homes built. There was also a fear that if something went wrong with offsite construction, the reputation within small communities would stick.

On a positive note, there was a consensus that offsite construction would increase quality and, as a result, reduce the number of snagging items. The belief was that the factory built environment would ensure this. It was acknowledged that this would allow builders to further increase customer satisfaction.

Builders also agreed that use of offsite for show homes and early units on a new development would allow the quick creation of a street scene to offer a good impression to customers.

Others

Warranty Bodies

There was a clear perception that NHBC and other warranty providers have been slow to underwrite new methods of construction.

There appears to be no knowledge of "Buildoffsite" and the work that it had been undertaking.

Surveyors

Whilst it was felt that the customer did not mind how the home was constructed, there was concern expressed about the approach to valuation from surveyors not familiar with the build. The resale value for the customer was also a factor here.

Lenders

Correlating with the concerns regarding warranty bodies and valuations was the impact that new methods of construction would have on a customer's choice of mortgages.

In the main this was a perceived issue with no evidence presented, however, one Model 3 company expressed real concern about the difficulty it had in securing warranty cover and the impact that had on customers.

“There was a clear perception that NHBC and other warranty providers have been slow to underwrite new methods of construction.”

Support

Consideration was given to how the industry could be supported to encourage builders to fully explore offsite construction.

Universally Accepted Definition

It became clear throughout this research that there is not a common, agreed definition of “modern methods of construction”, nor “offsite construction” within the home building industry. This in itself could act as a barrier.

A starting point in the provision of support should therefore be the development of a universally accepted definition of “offsite construction”.

A short life working group should be set up to scope and develop the definition which should then be promoted by all stakeholders (Scottish Government, Homes for Scotland, Construction Innovation Centre, builders and the supply chain) to ensure awareness, understanding and acceptance of that definition.

Cost Analysis

The research found a very high perception surrounding the costs of utilising offsite methods.

Home builders strongly believed that offsite construction would result in higher build costs. Whilst there was an appreciation that savings could be made through quicker build programmes, avoidance of time lost due to bad weather and potentially a cheaper skills base, builders had not undertaken any analysis to compare costs taking potential off-set savings into account. Home builders therefore work on an assumption that costs are higher.

There was very high demand from builders interviewed (all except the two Model 1 builders with internal offsite capabilities who were well versed on costs) for support in understanding how a detailed costs analysis could be undertaken.

It was proposed that a workshop format would be useful, with general lessons on how to take different factors into account. The importance of the workshop facilitator being independent (i.e. not from a Scottish offsite manufacturer) was seen as key to the buy-in of the information being presented.

There was discussion in the interviews as to what costs and factors the comparisons should account for, an example being the transitional costs with reducing trade labour and site supervision and how that could be factored into the analysis. In addition, it was felt that consideration should be given to the variables such as house types, repetition of design and site layout.

Before the workshop is organised, it would be beneficial to scope and agree with builders and the supply chain what should be included within the costing exercise. Building upon this work and the interest already gauged, HFS could effectively facilitate such a session.

After the workshop, it was agreed that support for individual businesses, on request, would be hugely beneficial. Whilst this would involve the sharing of commercially sensitive information, the detailed analysis is required to allow businesses to assess pricing based on their own procurement structures, taking account of group deals for example.

It was proposed that, as part of the cost analysis exercises, an acceptable level of cost would be agreed for the benefit of the supply chain. For example, if offsite suppliers can achieve X (percentage reduction) then builders would be willing to utilise it. It is understood that this commitment would allow suppliers to invest but at this moment in time the value of X remains an unknown.

Support for an Infant Industry

The biggest barrier noted from the research stopping the adoption of offsite methods is cost.

Whilst this may be a perceived barrier, if the full cost analysis results show real cost differentials then there is the suggestion that Government support be used to help fill the gap. It may be that support is only required to support a transition towards offsite, until the benefits of economies of scale and other reduced site costs are realised.

The support could be directed in a number of ways. A financial incentive could be available to builders to encourage leaders/first movers and compensate for additional build costs. Another option would be to offer financial support to the supply chain to allow it to discount pricing. Alternatively, additional site costs could be mitigated through planning gain requirement reductions, although it is appreciated that the appetite for offsite in this event would need to be driven by local government.

R&D Assistance

The research shows that lack of R&D resource within home builder companies is a significant reason why companies across business models had not fully explored offsite opportunities.

A suggestion came forward from a number of interviews that companies would benefit from R&D assistance. This could be in the form of budget support or a seconded resource and perhaps points to a role for the Construction Scotland Innovation Centre.

Supply Chain Promotion

It was clear that there was interest from builders across business models to find out more about offsite opportunities.

Whilst there may be limited resource within home builder companies to pursue innovation, the companies interviewed suggested a higher profile role for the supply chain.

“Home builders are coming out of survival mode and we need the supply chain to come forward with an innovative offering” (Model 5 company)

A number of home builders mentioned site visits that they had attended and how the visits had usefully raised their awareness on what could be achieved: “seeing is believing” (Model 5 company).

More of this open approach needs to be encouraged and it was suggested that HFS could play a role in facilitating home builder site visits.

It was noted that there was some nervousness from timber frame suppliers with offsite capabilities when approached by builders who had their own timber arm (Models 1 and 2).

Our findings suggest, however, that the homes for sale businesses have, in the main, the authority to contract external suppliers so it should not be assumed that enquiries are to “rip-off” ideas but rather recognised that companies are genuinely shopping around for the best supplier.

Whilst it is recognised that the supply chain is in competition, in order to receive greater buy-in at scale from the home building industry, there is a commonly held belief that the suppliers should work harder to promote themselves on an individual and collective basis.

“The supply chain must up its game and promote itself much harder.” (Model 5 company)

Examples Overseas

As well as better showcasing what could be achieved in Scotland, home builders indicated their keenness to understand what home building industries in other countries are achieving through offsite construction.

This suggests additional research to identify useful comparatives and to establish what makes it work elsewhere.

Clear objectives would need to be set in terms of what we want to learn from the research. This could be followed up by exchange visits or field trips building upon the “seeing is believing” concept identified above.

Reflecting on the Housing Fair trips offered to home builders through HFS in the past, a role was suggested for HFS in facilitating research and field trips.

In addition to examining examples with home building in other countries, it was agreed that lessons from other industries within the UK may assist learning - the exploration of lean principles from car manufacturers for example.

Knowledge Exchange

Home builders suggested that knowledge amongst the professional ranks must be improved.

Whilst there was some awareness of what Napier and other institutions have been working on, there was a strong feeling that knowledge should be shared more widely in order to allow home builder professionals to learn more.

It is absolutely essential that this knowledge reaches the industry rather than being stored in academia and it was felt that there was an advantage in Scotland for this action over anywhere else due to the established networks and the funding for the Construction Scotland Innovation Centre.

With the target audience home builders themselves, there is a clear role here for HFS in ensuring that the information is accessible to its members.

“ Clear objectives would need to be set in terms of what we want to learn from the research.



Scottish Government-Led

An interesting concept which emerged from a number of interviews was that the Scottish Government should lead the way in offsite construction through its affordable housing funding programme.

HFS members have closely followed the Construction Procurement Review and continue to promote the standardisation of design to achieve best value through procurement through the housing implementation work being led by Mark Turley.

With the Scottish Government providing funding for c5,000 homes each year, it is, in essence, the biggest home builder active in Scotland. It is therefore strongly believed that the Scottish Government should be taking advantage of the economies of scale available at this volume as opposed to letting Local Authorities and RSLs set their own design specifications.

There are already examples of how efficiencies could be achieved when affordable housing is delivered on Section 75 sites by volume home builders utilising their economies of scale. These efficiencies could be replicated on RSL or Local Authority-led developments.

An interesting exercise suggested through the interviews is for the number of different house types (how many 1 bed, 2 beds, 3 beds etc.) being delivered through the affordable housing programme to be counted.

A calculation could then be undertaken to assess how many more affordable homes in a standard house type could be delivered for the same budget when benefitting from the efficiencies in mass production.

The repetition offered through a standard house type at this volume would lend itself perfectly to offsite construction.

It should be noted that the Scottish Government has significantly invested in offsite construction through the Greener Homes Innovation Scheme.

Backed by £12.6m of investment, the scheme will support the construction of 319 affordable homes, promoting greener methods of construction and help enable families to save up to £1,000 per annum on running costs. With the majority of these projects now started on site, the Scottish Government intends to evaluate the scheme later in 2015.

Engaging Planners

In providing support towards the use of offsite construction, home builders suggested that Local Authority planners had to be part of the discussion. Engagement will be key in relation to local design guides.

Engaging Warranty Bodies, Surveyors, Lenders

A strong concern amongst home builders is the buy-in from warranty bodies, surveyors and lenders since home builders cannot build homes that customers cannot buy.

The level of awareness of work undertaken by organisations such as "Buildoffsite" is currently very low but it is crucial that buy-in is secured and builders are confident that their selected method of construction is not reducing mortgage choice for their customers.

Engagement with these bodies should therefore feature heavily in any support programme.

Conclusion

With a list of drivers identified, no resistance to the principle of offsite construction was noted from anyone. However, the strong perception that offsite construction is more expensive is the most fundamental barrier.

The different levels of decision-making amongst the five business models identified may have had an impact on attitudes and rate of adoption towards offsite construction, but the cost increase remained a common thread.

In addition, lack of R&D and pack mentality within the industry to do things in tried and tested ways greatly reduces any driver towards first mover advantage.

There are real concerns about the lack of control in programming and pricing if a higher proportion of build was controlled by one supplier as well as the capacity of the supply chain to deliver a sharp increase in output.

With the industry still recovering from the downturn and reluctant to build volume speculatively, there is also the strong belief that offsite would only work in confident markets where demand is high and predictable.

Any move to offsite should therefore be considered an evolution.

This research recommends a list of actions that could play a part in supporting this evolution and HFS looks forward to playing its part in the delivery of such support.

However, in concluding this work, it is important to return to the starting point which clearly stated that any move to offsite construction must be demand-led.

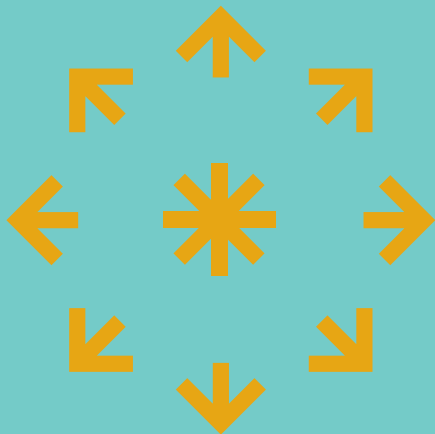
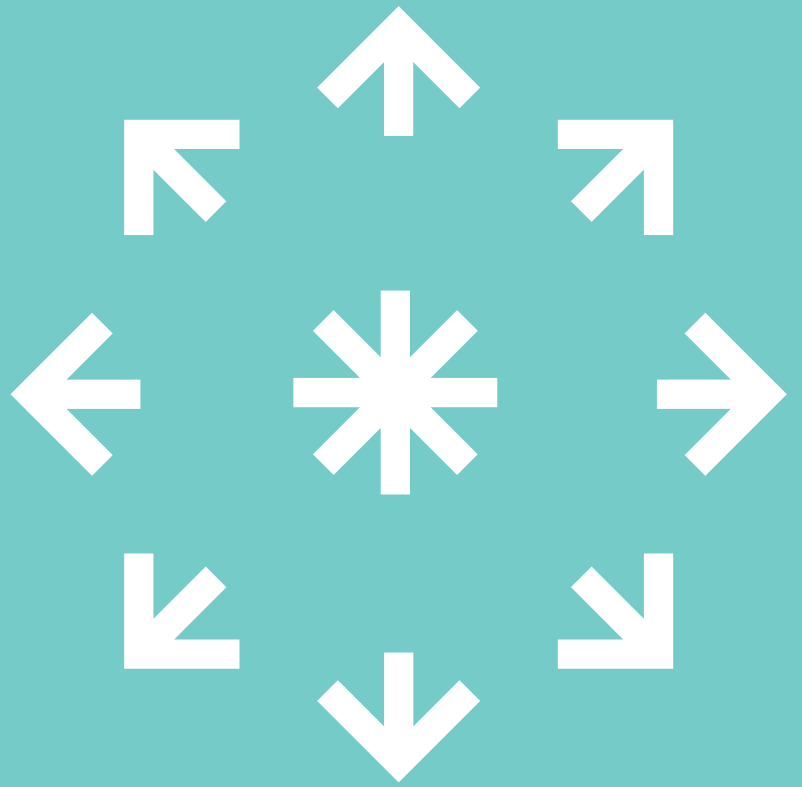
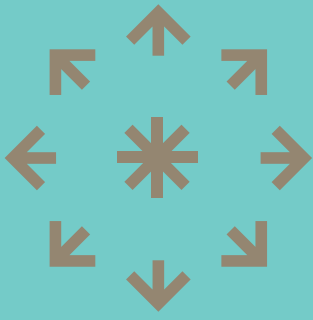
The evidence suggests the business case for offsite construction still requires to be established.

An environment where home builders can take steps towards OSM and innovative construction methods must take into account the flexibility required by commercial businesses in delivering products to their customers.

“The evidence suggests the business case for offsite construction still requires to be established.”



Recommendations



Problem

A. There is a lack of a universal definition of offsite construction.

B. The home building industry has indicated that a knowledge gap with regard to the available knowledge and resources to undertake whole life costing analysis exists.

C. It is recognised that the industry now lacks R&D resources to adequately undertake analysis of offsite construction.

D. It was commonly expressed that the industry is not fully aware of what supply chains can offer.

Recommendation

1 A short life working group should be set up to scope and develop a universally agreed definition for offsite construction in home building.

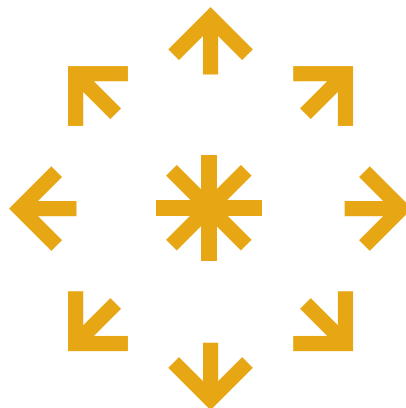
2 An industry workshop should be conducted to scope and agree what should be included within a costing exercise.

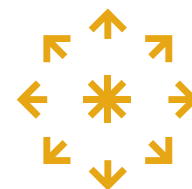
3 A series of generic workshops for industry members to engage should be developed and held to promote the knowledge base to enable home builders to undertake whole life costing.

4 Construction Scotland Innovation Centre to examine its role in supporting the industry develop R&D capabilities.

5 There is a need to improve the collaborative network of knowledge exchange between industry and academia.

6 There is a need for greater promotion and showcasing of the native OSM supply chain.





Problem

E. The Scottish and UK OSM sector is perceived as being young, with the industry as a whole thought to be lagging behind our international counterparts.

F. The home building industry has noted a lack of appetite for risk, showing a reluctance to be trailblazers or obtaining first mover advantage.

G. There are a range of stakeholders that need to be taken on the offsite construction journey, to ensure universal buy-in.

Recommendation

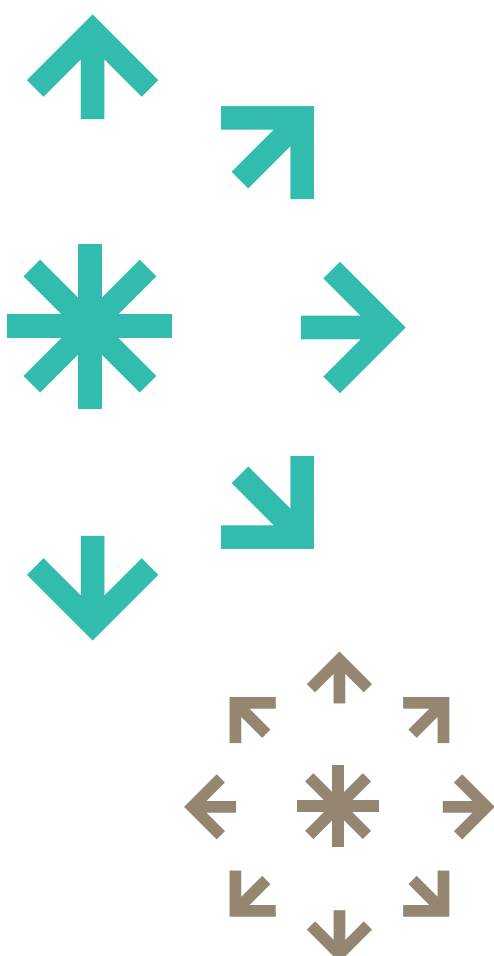
7 Greater knowledge and understanding should be sought to what happens overseas, where appropriate. Greater understanding should also be sought from what could be learned from other industries within the UK.

8 Given the scale of funding provided for affordable housing programmes there is the opportunity for the Scottish Government to provide leadership and promote the use of offsite construction through its own affordable housing programmes.

9 Dissemination of Scottish Government learnings from use of OSM as part of the Greener Homes Innovation Fund

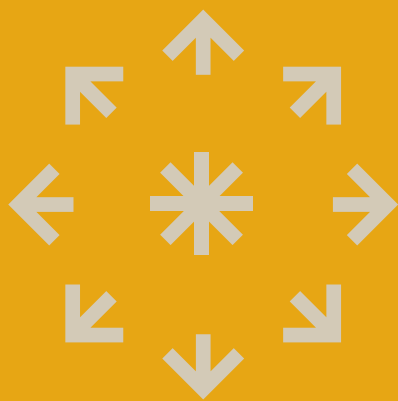
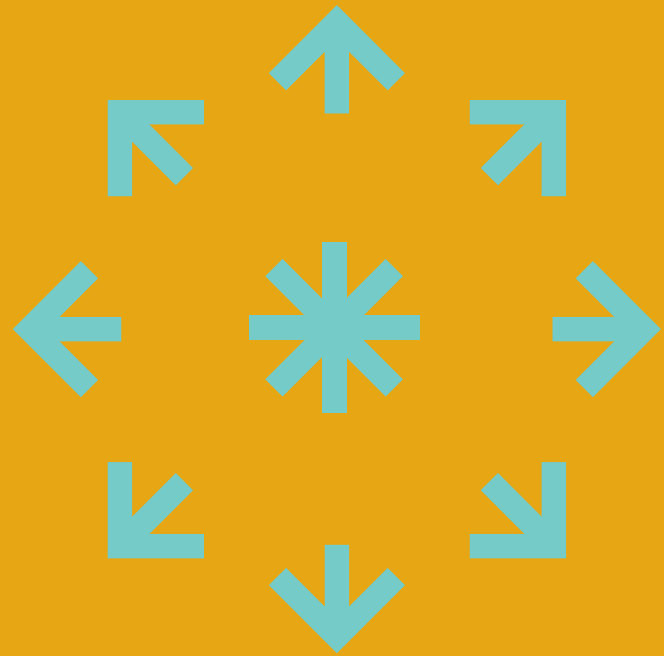
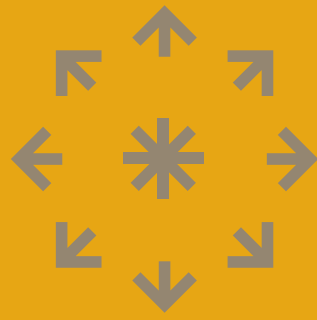
10 Greater engagement with local authority planners with regard to local design guides.

Rec 11 Engagement with other stakeholders such as lenders, insurers and warranty providers to achieve universal buy-in.



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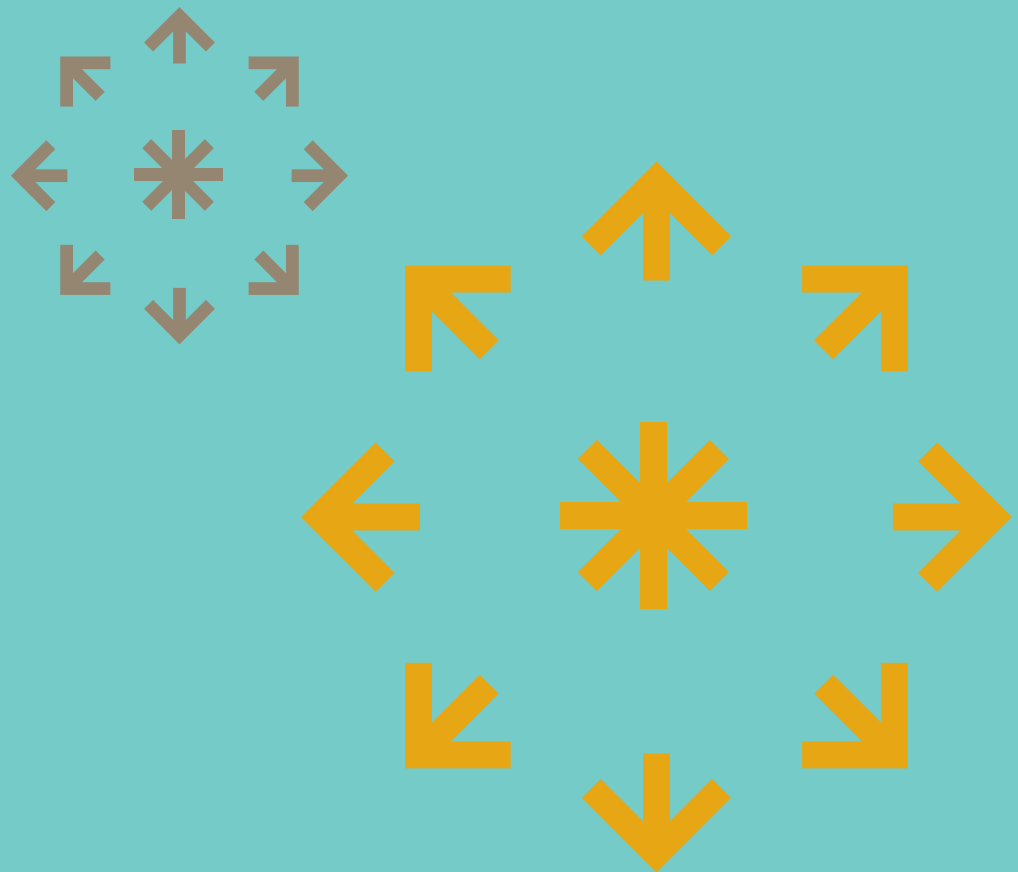
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