ARE HOUSEBUILDERS' PRODUCTION STRATEGIES A BARRIER TO OFFSITE CONSTRUCTION UPTAKE IN THE UK?

ABSTRACT

More than three-quarters of all new UK housing is currently delivered by the private sector using predominantly traditional, site-based, construction methods. Recently, the house-building industry has found itself under increasing pressure to raise production output to alleviate a shortage in housing supply and reduce house price inflation. Within this setting, there has been much interest in the potential offered by off-site construction (OSC). The production strategies employed by private house-building firms however, are a direct response to their operational environment, and the adoption of OSC would arguably alter the way that they deliver their developments. Hence, there is a clear need to understand the relationship between production strategy and construction methods. Based on a case study of one of the largest private house-building firms in the UK, the potential impacts of OSC on current production strategies have been explored. The results indicate that the adoption of OSC approaches may alter the manner in which house-building firms are able to manage their production process, reducing their control and restricting the very flexibility on which their own success relies. The findings have implications for the housebuilding industry, OSC manufacturers and construction research, given the ongoing interest in OSC as a means to address the UK's housing supply issues.

Keywords: housing, housebuilding, methods, organisation, off-site, production, strategy.

INTRODUCTION

The UK housebuilding industry faces increasing pressure to address a growing housing supply problem. In 2004, Kate Barker's Review of Housing Supply concluded that 245,000 new homes were required each year in order to meet household growth and reduce house price inflation (Barker 2004). Following the financial crash of 2007/8, and a significant decline in housebuilding activity, the UK now finds itself 1.5 million homes short of Barker's targets (HBF 2014). Despite a sustained period of recovery in recent years, just 145,000 new homes were completed in 2015 (GOV 2016) against a current estimated need in excess of 300,000 homes per year (HBF 2014). Such figures highlight the scale of the problem faced by the industry, and indeed the country.

It has commonly been argued that off-site construction (OSC) could offer a solution to the UK's under-supply problem (Housing Forum, 2002; NAO, 2005; Miles and Whitehouse, 2013). Yet, despite reoccurring phases of government and industry interest in OSC, uptake by private housebuilding firms remains low (Pan et al, 2008; Taylor 2010). Using a case study of one of the largest private housebuilding firms in the UK, we examine housebuilders' current production strategies (i.e. strategies employed during the construction phase of new housing developments) and explore how OSC adoption could impact upon them. These initial findings go some way to accounting for the lack of adoption of OSC in mainstream housebuilding construction.

UK HOUSING SUPPLY

Since the rapid decline in public sector housebuilding during the 1980's, the private sector has delivered more than three quarters of all new housing in the UK (GOV 2016). Total supply has more than halved since the 1970s, although the average private sector contribution has remained fairly constant with annual completions of around 140,000 units per annum (Miles and Whitehouse 2013). The private sector is represented by a diverse mix of firms, from large multi-national developers, to small local builders. However, recent decades have seen the increasing dominance of a relatively small number of large housebuilders (Ball 2010; Callcutt, 2007), the top ten of which deliver around half of all new homes (HBF 2015, GOV 2016). As such, any increase in housing supply appears disproportionately reliant, not only on the private sector, but on a small number of individual firms.

The majority of these housebuilders operate under the 'current trader' or 'classic' business model, overseeing all aspects of the development cycle from land acquisition through to construction and sale (Callcutt 2007; Ball, 2010). Homes delivered in this manner are built speculatively for the owner-occupier and investment markets, relying on good local market knowledge to deliver profitable returns. However, it is widely accepted that the UK has a volatile housing market with persistent, though unpredictable, boom and bust cycles. This creates an uncertain, and therefore risky, operational environment (Barker 2004; Callcutt 2007; Ball 2010).

It is no surprise then, that housebuilders are conservative in their approach to production; managing the pace of production to suit sales rates (Callcutt 2007; Miles and Whitehouse 2013) and responding quickly to changes in market conditions (Ball 2010). Indeed, Ball (2010) suggests that it is this inherent need for flexibility which leaves housebuilders wedded to the use of traditional materials and subcontract labour (Ball 2010). Yet, this relationship, between a housebuilder's production strategy and the construction methods they employ, is an area of research largely unexplored in current OSC literature.

We would argue that a better understanding and appreciation of housebuilders' production strategies is required if the industry is to successfully adopt more OSC as part of a solution to the UK's housing supply problem.

RESEARCH METHOD

Based on the problem context set out above, two overarching research questions are proposed:

1. How do private housebuilders in the UK currently deliver new housing developments (i.e. what production strategies do they deploy?), and why do they do it this way?
2. How would the increased adoption of OSC methods impact upon housebuilders' current production strategies?

This paper reports on the first of a two stage research design, drawing on data collected from a single-firm case study with a major UK housebuilder. This inductive, theory-building exercise will be used to inform a second stage of enquiry across multiple firms (Lang et al. 2016), recognising the benefits of case study work with regards to depth of data but equally addressing concerns regarding the generalisability of the results (Yin 2014).

The selected case study firm is one of the UK's largest private housebuilders operating nationally through a network of regional and divisional offices. A total of fifteen semi-structured interviews were conducted with key personnel from its head office and two divisional offices. The respondents were carefully selected with the help of the firm's senior

management to provide a cross-section of roles throughout the housebuilding process, such as technical directors, commercial managers, procurement managers, and contracts managers. All interviews were conducted and transcribed by the primary researcher during the summer of 2014.

An initial question set (based on the literature review and internal documentation) was used to explore the firm's production process. Respondents were then presented with a number of OSC examples to stimulate discussion on the impact of construction methods on production strategy. The use of semi-structured interviewing allowed emerging themes to be incorporated as the case study progressed (Proverbs and Gameson, 2008, Bryman, 2012). Transcripts were written up following each interview and emerging themes were introduced as additional questions. The core set of questions remained the same throughout the interview process to maintain repeatability and ensure comparable data for analysis (Walliman, 2011). Thematic analysis was applied based on the structured method described in Braun and Clarke (2006). All transcripts were coded using a semantic approach, key themes were identified and findings are reported below with reference to both the original research questions and the existing literature.

Given the housebuilder's lack of experience implementing OSC methods at scale, conclusions should be drawn with caution and taken as perceptions and expectations rather than evidence-based observations.

RESEARCH FINDINGS

The research findings are presented with reference to two key themes identified from the data analysis: flexibility and autonomy.

Flexibility

During the construction phase, the amount of 'work-in-progress' (WIP) is continuously monitored in line with current sales rates. Although market dependent, housebuilders generally aim to minimise WIP; organising materials and labour as required to avoid accumulation of completed but unsold housing stock.

"We could have a plot which goes up to stage one foundations and then it'll stay dormant for another six months until it's sold…then we'll say, ok, a customer likes this plot, we're 'gonna start bringing this one up now" (Senior Design Technician - Group)

"On-site, you could say, stop on that plot, leave that one where that level is we don't need to carry on with that one…its more reactive to the market" (Buyer - Division)

Accordingly, a number of respondents cited the need to vary production speed in response to sales rates – especially in slower than expected markets. Although current housing market conditions allow housebuilders to construct homes quickly, in slower markets production is carefully controlled, with each sale releasing a new plot for construction.

"[Previously] once we sold it, we built it…occasionally if you've got a row of terraces you end up with a few stock plots, but we wouldn't take them through to completion, we would hold them… effectively that's how we've run our business for the last, probably five years." (Senior Quantity Surveyor - Division)

"[If sales slow down] they will slow me back on the build a little but, the problem will arise that a month later the sales might pick up and, right, we want those houses now". (Contracts manager - Division)

The use of traditional building materials, assembled on site, gives a housebuilder significant flexibility regarding the construction programme. For example, where sales are slow but

certain house types are proving more popular, they are able to refocus the construction programme in favour of more popular units.

"At the end of the day, it's pointless building that house over here that's not selling that well…whereas we've got five over here that are selling like hotcakes…Any site is shifting and changing all the time" (Senior Design Technician - Group)

"You might say, well actually the market's slowing down a little bit, let's build those affordable [units] over there…or if the market's like banging along it's like, yea people keep coming in saying I want a five bed detached we'll keep thrashing along with those. We do monitor what's going on, so we will re-plan sites. So suddenly we'll say actually this house type, or these houses here, are holding back…and we'll look at redesigning the scheme" (Design Manager - Division)

Having reflected on the merits of traditional materials, respondents expressed concern over housebuilders' ability to control WIP, and thus to respond to the market, when employing OSC methods – particularly given the longer associated lead-times. Where the housebuilder commits to the production of a number of units in advance, a slowdown in sales may lead to the accumulation of stock which has already been paid for (or at least contracted to) but cannot be sold. Moreover, the speed at which OSC houses are constructed leaves the housebuilder much less able to control pace of build at the individual unit level.

"If this is a very quick method of construction, then you have to look where sales are because we don't just want to be building stock to stand there" (Design Director - Group)

"Because of the market we're in we have to have that flexibility because otherwise you end up with either a lot of stock of properties that money's tied up in, or you can't build quick enough. I think you have to have [a construction method] that is very flexible to the market demand" (Buyer - Division)

Offering a potential solution, some respondents suggested that OSC systems could be procured centrally at the group level and distributed to development sites as needed to alleviate fluctuations in sales demand. However, at present, regional variations in planning requirements were seen to be a significant barrier to the level of standardisation required to operate in this manner. Respondents also acknowledged that this would require a significant amount of planning, storage space and working capital.

"You could be having a pod which you can arrange in different orientations: Group may approve three or four different rooms, and how we then structure them on a particular site or a particular house would be a Divisional choice rather than a Group choice". (Contracts Manager - Division)

"That's where we find a lot of conflicts with local authority; we're pushing standard and they're saying well we don't want standard, we want something that looks a bit more like what's next door to your site". (Contracts Manager - Division)

Autonomy

It is apparent that the suitability of an OSC approach may be development-specific. For example, OSC was deemed more suitable for developments with a high proportion of pre-sales, or poor access to local labour, than for developments with restricted access. Moreover, such factors may change over time, requiring constant evaluation. The firm's current approach to specification – a centrally controlled, national construction specification, supported by large materials purchasing agreements - currently leaves divisional offices with little influence over the construction methods employed. Accordingly, the need for increased autonomy at the firm's divisional levels, when implementing OSC, emerged as a topic of

considerable debate during the interview process. This appears to be in contrast with the idea of a centrally controlled procurement arrangement suggested previously.

"[The company] is very much Group led all the way from the top, so they believe everything should be standard…any Divisional alterations should be an absolute minimum" (Senior Design Technician - Group)

"Nine times out of ten, by the time I reach developments, the specification has been set" (Senior Quantity Surveyor - Division)

A number of respondents expressed concerns regarding commitment to any single OSC system, suggesting that divisions would need to select a suitable approach based on local requirements. It was suggested that having the freedom to choose from a number of group-approved construction specifications (both on- and off-site methods) may allow sufficient flexibility whilst maintaining some level of central control over national construction specifications.

"We won't put all our eggs in one basket and go to a specific system, because we've got to be adaptable…geographically certain products may only be available to certain parts of the country" (Senior Commercial Manager - Group)

"…you need that functionality and that ability to change for different scenarios. One system might not work on a particular site where it works perfectly well on another…Group could produce four of five different documents on the ways we could achieve it and then that goes down to the Divisional level on how we want to approach it" (Contracts Manager Division)

Respondents working at the Group level also raised concerns over a reduction in 'buying power' where multiple OSC suppliers were utilised. Conversely, it was expected that introducing choice at the Divisional level may increase competition between manufacturers and therefore balance out any buying power lost. Some respondents did not expect the firm to allow increased autonomy on the basis of needing to conserve a nationally recognisable brand and to maintain control over quality across all developments. In addition, concerns were raised over the practicalities of managing multiple specifications and suppliers. The single standard Group construction specification was seen as the main tool with which the firm currently ensures continuity and consistency across its national operations.

"[The centralised structure] all has to do with quality, consistency and of course, commercially, the buying power" (Senior Design Technician - Group)

"With [the company] being the size they are, it's that familiarity. If everyone is doing something slightly different, how would that impact upon the brand?" (Senior Quantity Surveyor - Division)

DISCUSSION

Drawing on the results presented, the discussion is framed around the two overarching research questions posed earlier.

How do housebuilders currently deliver new housing developments (i.e. what production strategies do they deploy), and why do they do it this way?

Underpinning the current housebuilding business model is the need to respond rapidly to uncertain market conditions (Ball 1999, 2010). Careful management of cash-flow is key during the production phase and WIP is continuously monitored and controlled in line with sales rates (Venables et al 2004; NHBC 2006; Callcutt 2007; Ball 2010; Payne 2016).

Therefore, in contrast with Adams and Leishman (2008), we propose that the need to vary the production speed in line with market conditions is a critically important component of housebuilders' current production strategies.

The circumstances in which production speed is altered appear almost exclusively related to *poor* market conditions, with respondents making little reference to what the housebuilders' typical response was to *higher* than anticipated sales. This distinction may support the view that housebuilders are generally unwilling to increase production beyond planned rates as it is not profitable to do so (Callcutt, 2007; Adams and Leishman, 2008; OFT, 2008; Miles and Whitehouse, 2013).

In line with Adams and Leishman (2008), changes to the mix of house types contained within the development (re-mixing) did not appear to form part of the firm's production strategy. However, the need to adjust the construction programme to progress more popular house types or plots (re-programming) *was* identified. As with variation of production speed, alterations to the construction programme appeared to take place during poor market conditions, although the specific conditions under which re-programming is, or can be, undertaken was again unclear.

How would the adoption of OSC methods impact upon housebuilders' current production strategies?

Although the findings lack clarity with regards to the extent and conditions under which production speed and programme are varied during the production phase, it is evident that the use of traditional construction methods supports a 'flexible' production approach (Ball 1999, 2010; Payne, 2009; Housing Forum 2012). Housebuilders can currently adjust production speed at both the unit level (how quickly each house is constructed) and the development level (how many houses are under construction). Additionally, as the core materials used are not plot specific and may easily be moved around the development site, housebuilders are able to purchase materials without committing to the timing or location of their assembly.

In agreement with Ball (2010), respondents suggested that the adoption of OSC methods would reduce housebuilders' flexibility to respond to changes in the housing market. The longer lead-times associated with OSC methods (i.e. the off-site manufacturing stage) require the housebuilder to commit to a production schedule significantly in advance of sales. Where market conditions decline, or are not as anticipated, respondents felt housebuilders may be powerless to reduce WIP, and limit capital exposure, accordingly. As identified by Pan (2006) the risk of committing to production so early is a key concern for housebuilders looking to adopt OSC – there is a keen sense of a risk that they will no longer have full control of production on site.

However, it should be noted that the need for flexibility during production is a response to conditions of market uncertainty (Ball 1999, 2010; Barlow et al. 2003). As such, where the operational environment is more predictable (e.g. a significant proportion of the development is sold from plan), it seems logical to assume that the need for flexibility in production would diminish. Notwithstanding the need for further research on this aspect, we may therefore infer that a decision to employ OSC methods should be made on a development-specific basis, thereby accounting for local factors and their influence on the production strategy employed.

CONCLUSIONS

The UK housebuilding industry is under pressure to address a long-term lack of new housing supply in the UK. Around three quarters of all supply is delivered by private sector housebuilders, and any increase in supply is disproportionately reliant on a small number of

large firms. The adoption of OSC has often been advocated as a solution to supply constraints and, yet, uptake by housebuilders remains low.

On the basis of this case study, we feel that an argument can be made that an understanding of the environment in which housebuilding firms operate, and the production strategies that they employ in response, is critical to the adoption of more innovative methods of construction such as OSC.

A single-firm case study within one of the UK's largest housebuilding firms has identified that flexibility (in production speed and programme) form integral components of housebuilders' production strategies. The adoption of more OSC methods was believed to limit flexibility and thus reduce their ability to respond to changes in housing market demand.

We therefore argue that the relationship between construction *method* and production *strategy* should form an integral part of housebuilders' OSC decision-making processes, and that the use of OSC methods should be determined on a development-specific basis. In our case study such a devolved decision-making approach was not evident, perhaps explaining why the case study firm had not adopted OSC.

When considered as a mechanism or lever for change within a firm, it is also clear that the concept of 'flexibility' in housebuilding production (Ball 1999, 2010) requires greater research and a more detailed and explicit definition, especially given its relationship to the selection of construction method. Certainly, in the case investigated here, the idea that OSC could solve the UK housing supply crisis seems to lack consideration for the manner in which the majority of new homes are delivered.

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