# Immovable object?

## Barriers to innovation in English Speculative Housing

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## Introduction

Junior Construction Minister Beverley Hughes, speaking at the 2000 Housing Design Awards, announced that:

> *"We want developers of the future to get away from the type of low grade, poorly designed, run-of-the mill housing which has been an all too familiar feature of our urban fringes in recent years."*[1]

Such complaints are not new. Speaking at the 1992 Housing Project Design Awards, then RIBA President Richard MacCormac compared the output of the volume house-builders to British catering of the 1950s and 60s:

> *"Housing is viewed as a neccessity rather than something on which one might express taste and choice"..."In the same way that the British were always being told that they wouldn't swallow variety in the quality of food and catering on offer, so we are being told that the British do not choose to live in well-designed homes. How can they choose when they are not being offered a choice?"*[2]

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It is not only the products of the house-building industry that are under criticism, but also its construction and operating practices. The 1998 Egan Report, 'Rethinking Construction', found inefficiencies in methods and processes across the whole UK construction industry, and Egan deemed it necessary to set targets for an annual reduction of 10% in construction cost and time, and an annual reduction of 20% in defects. In addition to these problems with cost, time and defects, house-building also has acute difficulties with land availability, regulation and clients, and the report singled out the sector for particular attention as the most worrying part of an inefficient industry[3].

Attention is currently focused on the house-building industry because a crisis has been identified in housing provision: Demographic shifts, changes in working and leisure practices, increased environmental awareness and increased mobility are all having an impact on the English housing market. The net effect is to both increase the demand for new houses beyond the capacity of the current industry and to ensure that the nature of the houses that are built must change. However the ability of the house-building industry to meet the challenge is in question: Despite dissatisfaction with speculative house-building, it has consistently proved difficult to introduce innovation in the industry. The entrenched position is that whilst architects and government ministers lambaste the design and construction quality of speculative houses, house-builders continue to produce and sell them successfully.

House-builders' success in drawing profits from a product that has changed little for decades is evidence that there are barriers to innovation in the industry, and that these have been sufficiently high to mitigate any pressures for change. It is increasingly widely recognised, including amongst house-builders themselves, that innovation is required if the demand for new homes and the need for new types of housing is to be satisfied. In order for this to happen the barriers to

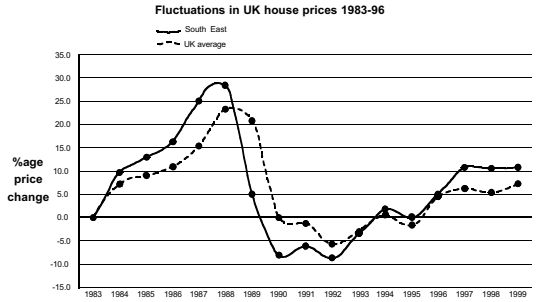


*Figure 1: Volatility in the English housing market, 1983-'99*
*Daa source: Halifax Property Index*

innovation within the industry must be clearly understood: this essay explores these barriers in an attempt to clarify their relative significance and vulnerability.

## The housing market

The housing market in England is notoriously volatile, and particularly so in the South-East, the area with the highest demand for new housing (fig. 1). A high level of owner occupation (68% in 1997)[4] is complemented by high levels of mortgage borrowing (61% of privately owned homes are mortgaged)[5]. These factors, combined with the expectation of housing to perform as a personal financial investment, make the market highly sensitised to fluctuations in the economy and interest rates.

The powerful notion of the house as the principal form of investment in England has its origins in the advent of the building society movement in the nineteenth century. These non-profit making organisations were set up to allow the working person to break the power of the unscrupulous landlord, by providing affordable finance to buy or improve private homes. In the absence of good quality, affordable rented housing, mortgaged home ownership has become the norm. Consequently, large amounts of private capital are tied up in the family home, and it is now essential for the economy that the value of this investment should continue to rise.

However, the balance between investment and borrowing is precarious, with the housing market mirroring and exaggerating, as well as influencing, tendencies in the wider economy. This places the performance of the housing investment largely beyond the control of the private owner, as the 1980s boom and early 1990s crash in the housing market illustrated. Improving economic confidence and financial deregulation in the 1980s made it possible to borrow ever-larger multiples of annual income at low interest rates, encouraging house buyers to take

on large mortgages and driving house prices higher. When interest rates rose at the beginning of the 1990s, monthly mortgage repayments followed suit, house buyers' confidence was dented and house prices began to fall. The bubble burst in the housing market, leaving many recent purchasers facing 'negative equity', with their houses worth less than the value of their mortgage. Lenders became more likely to foreclose on mortgages and, as the number of repossessions spiralled, house prices fell further.

In such a volatile market, the key to making money on a housing investment is to buy and sell at the right time. The value of a house is thus separated from its intrinsic qualities, and the home becomes a money-making tool. In this scenario it is wise for the small investor (the home owner) to avoid financial risk by investing in a conventional dwelling, its value in a rising market will increase due to its potential as an investment, whilst in a falling market it will be easier to "ditch" than a less reassuringly familiar, unconventional house.

Housing market fluctuations adversely affect the speculative house developer during both upward and downward cycles. As the housing market falls, land prices fall dramatically, wiping assets from developers' balance sheets and threatening to force a halt in production and even to cause bankruptcy. To release capital locked up in developments already on site, house-builders have to price their houses aggressively, and a market already in decline is flooded with cut price products. In a rising housing market the land price, which forms a significant part of total production costs, increases sharply and house prices must be raised to maintain profit levels.

Whilst other manufacturing industries have developed methods that allow them to alter production rates quickly in response to consumer demand, house-building in England still relies predominantly on traditional production techniques with

long lead-in and construction periods. The system of regulatory approval faced by developers is also unresponsive to the urgency of high demand- at best the authorities might be expected to turn approvals around within a set time frame, regardless of the number of applications lodged, but in reality approval is likely to be delayed at times of high demand.

The lack of "agile production" methods in house-building and regulatory delays cap production rates, so that in a rising housing market demand increases but production rates remain the same. Setting a high price becomes a necessity in order to control demand, but this in turn drives the market higher.

Such volatility in the housing market directly affects house-builders ability to innovate. For innovation to flourish in any industry requires a sustained period of stable economic growth: under such conditions companies and their investors have the confidence to indulge in research and development, and the implementation of new technologies, secure in the knowledge that any innovations could give them a competitive edge whilst the costs of any fruitless work will not threaten profitability. In contrast, market volatility encourages a reliance on established practice. During strong upward cycles, house-builders profits are so good that innovation is not required, whilst memories of recent downturns continue to limit their investors' confidence. During downward cycles their main objective is commercial survival, and in this scenario an innovative product may even be a disadvantage- house purchasers will be looking for a secure investment rather than something out of the ordinary.

## The regulatory system

Even if house-builders were better equipped to respond to market forces, they would still find themselves constrained by the regulatory framework of planning

and building control. This framework pervades the market to a far greater extent than for general consumer products, for in addition to dealing with safety, it also sets (through the Building Regulations) performance standards and, (through the more controversial area of planning control) the impact of the product on the lives and interests of third parties.

A 1998 survey by the House Builders Federation found that 78% of house-builders classified planning delays as a "major constraint" on production[6]. The planning system is generally regarded as complex and time consuming, the major hurdle being the approval of detailed design and in particular external appearance. Whilst this level of design control is not part of planning legislation, it in fact constitutes a large portion of planning officers' work. With little or no published guidance on design requirements, the only way to establish what the approach of the planning authority will be is often to lodge an application and see what the reaction is. For a commercial house builder who wants to minimise delays, this system inevitably encourages conformity to expected norms, and produces designs that are 'difficult to refuse' rather than 'the best possible solution'[7].

Planning Policy Guidance Note 1[8] attempts to encourage good design, and in particular design that relates to a local context, encouraging but not enforcing the use of clear design policy and guidance. In practice this seems to have generated yet more frustration and delay, with many planning authorities calling on inde-pendent design consultants to advise on large schemes after outline permission has been granted. In this period the emphasis is on detailed design, and the project must go into "limbo" as the various parties try to reach agreement, often with only subjective criteria on which to base their judgment. It has been claimed that design-award winning housing schemes actually take longer to get through the planning process than their conventional alternatives[9]. A further limitation on housing form and site layout is the power vested in the Local Authority's

highway engineer, whose primary role is often seen as enforcing access routes for emergency vehicles, evaluating proposals by means of a "safety audit". The engineer can refuse to adopt site layouts without recourse to appeal, which encourages the submission of conventional, vehicle-access centred site layouts.

## The house-building industry

The high level of capital investment required for housing developments means that most large house-builders must go to the stock market to attract investors, becoming Public Limited Companies (P.L.C.s). The success of a PLC depends on the value of its shares on the stock market, and to be a commercial success the company must deliver maximum return (in the form of dividends) to its shareholders. The major shareholders in a PLC may well be institutions (such as pension schemes) who themselves have a statutory obligation to provide a good return for their customers. These types of investors are highly adverse to risk, which encourages P.L.C.s to avoid the uncertainty which is inherent in innovative practice and instead to follow tried-and-tested methods.

For such companies, innovation is largely restricted to quantifiable or incremental alterations in existing practice, for example increased site layout density or the application of architectural detail to improve "kerb appeal". An example of the cost risks associated with more wide ranging innovation can be found in the 1999 Peabody Trust housing in Hackney, London, designed by Cartwright Pickard. Although the system of modular steel framed prefabrication used will ultimately cut costs, this first building actually came in at around 15% above its target price[10] . Whilst the Peabody Trust, with its long-term commitment to innovation and the quality of its housing, is able to accept such a cost burden, fear of such an outcome would discourage a commercial developer, for whom short-term profit is the only goal.

The profile of the typical major house-builder has changed over the last two decades, with major companies such as Guardian Royal Exchange, Christian Salvesen and Tarmac selling off their house-building arms. The new players, whilst still being large P.L.C.s, are specialist house-builders. Without the backing of a parent company and operating in an increasingly fragmented and competitive market, they have fewer resources to invest in training and innovation, and must compete with other larger and potentially more lucrative sectors for labour, materials and plant. In effect this makes house-builders even less able to respond to increases in demand, in fact when the economy rises house production rates fall as the workforce is syphoned off and costs increase[11] . This fragmentation is compounded by the predominant use of sub-contractors for all but the most basic construction work, resulting in a large number of small employers who lack the resources to invest in further skills training.

## Land Banks

Fragmentation of the house-building industry has left house-builders more exposed to the vagaries of the market. In order to insulate themselves, many have become land speculators, accumulating sites when the price is low, but only building on it when the market is rising. This practice gives the house-builder a buffer against land shortages and unexpected delays in the development control process, allowing them to build at a steady rate and protecting their workforce from the consequences of any enforced cuts in production.

Operating such a 'land bank' arguably increases the amount of time for planning and design of developments, and so might be expected to increase the likelihood of innovative practice. However, counter forces act against innovation when large land banks are operated. Firstly, capital is tied up in the land, for which investors expect a return, and, as has been shown, an emphasis on meeting re-

turns on capital investments tends to limit innovation. Secondly, land price speculation has a greater and more quantifiable impact on house-builders' profits than does the margin made on the product itself, so "building in the right place at the right time" is of more commercial importance to the house-builder with a large land bank than "pushing the boundaries of housing quality". By way of comparison, the innovative, mass-produced and prefabricated housing found in Japan is possible in part because house-builders in that country are simply manufacturers and suppliers of housing 'units', operating independently of the site-assembly and development control processes.

## The client

As has been shown, there are a large number of factors relating to the framework within which house-builders operate that serve to limit innovation. Most, if not all, of these are beyond control of the house-builder, relating to the wider commercial and regulatory system. In addition to these problems, the producers of speculative houses have also been accused of being distant from their consumers, unaware of their needs and unresponsive to their demands. In this area also, house-builders face problems that set them apart from other product manufacturers, and although steps are being taken by some house-builders to increase "customer focus" and "consumer choice", the standard models for achieving this are often difficult to apply in the English house-building industry.

Innovations in housing are more likely to be found in purpose-built social housing than in speculative housing developments. It could be cynically argued that the occupants of social housing exert less influence, and expect less choice, in the design of their homes, and therefore make better subjects for experimentation. But it is also true that the different nature of the social and speculative housing clients plays a significant role in making innovation easier to implement

in the social housing arena. Housing Associations, and Trusts such as Peabody and Guinness, are experienced and expert clients who commission a large volume of housing. Their experience gives them an appreciation, rarely found in the speculative house buyer, of the risks and benefits of innovation. They have an greater interest in quality than speculative house builders, as their involvement in the running and maintenance of the property will be ongoing. Such clients are also articulate in expressing their needs, making it easier to ensure that innovative housing still meets their base expectations. The volume of housing they commission also makes the risk of a single, innovative "test bed" development more acceptable to Housing Associations and Trusts.

In comparison the speculative house client is usually inexperienced and inarticulate about their needs. They also have a much larger and more personal stake in the success (as both a home and an investment) of the house they are buying. Purchasers of new speculatively built houses are involved much later in the process than social housing clients, certainly after the main decisions have been made and usually even after the building is complete. Private buyers are only infrequent customers, moving on average only once every few years (and then not always to a newly-built house), and this limits the variety of new housing on offer. For producers, 'brand loyalty' is a very strong incentive to ensure that their product is distinguishable from that of their rivals, but with such infrequent contact this loyalty is difficult to maintain and the need for differentiation in the market place is lost.

Developing the brief for a new building is a complex process, one for which speculative house buyers and builders alike are not often well equipped. The most important part of choosing an existing house is the visit, during which the prospective buyer can 'imagine themselves into' the given spaces. Speculative housing developers build 'show homes' (and some are starting to use virtual reality

presentations) in an attempt to replicate this experience, allowing them to sell "off plan" before the houses are completed. This opens up the potential for customisation of the designs between purchase and completion, but in fact the designs are usually standard house-types and customisation is difficult because of the building methods used. Even if innovative construction techniques and a range of customisation options are introduced, house-builders will need to improve their methods for establishing customers' needs if this potential for customisation is to be exploited. Commissioning a custom designed one-off house involves thinking carefully about, and possibly also challenging, current living patterns and needs, projecting those into the future and communicating them to the designer. The speculative house-builder cannot devote as much time and effort as the custom house designer to this process, nor can they tailor their output to the same extent, but if they fail to offer any level of customisation for the individual customer they will lose a potential advantage for their product over the existing stock of houses.

It is usually the speculative house-builders who are held responsible when the form and appearance of their developments are criticised, however the blame must surely be shared by the English house buying public. The industry is on difficult ground in taking its lead from the customer, as the English have a particular set of cultural aspirations connected to housing which limit the range of possible solutions available to the developer. The expression "an Englishman's home is his castle" may relate more to a desire for privacy, ownership and security than any outward fortified appearance, but nevertheless a romantic nostalgia for past, even feudal times seems to colour the English perception of their housing needs. There are two predominant models: The rural stately home in extensive grounds and the nostalgic recreation of idyllic village life, centred around the parish church and the village green.

Contemporary volume house-builders can rarely, if ever, provide the community focus, variety of house types, density or fine urban grain found in most small English villages, however they are obliged to make allusions to village life through meandering streets and low density "organic" housing layouts. Alternatives to this urban form have gained negative associations in English housing; higher density terraced housing is linked to overcrowded developments for industrial workers, whilst high-rise living is reminiscent of the failed public housing of the 1960s. A far more popular model of development is the utopian "garden city" of Ebernezer Howard, though the social ideals and design principles of cities such as Welwyn are incompatible with profitable large scale development; what remains of Howard's vision is the low density pattern of detached or semi-detached private houses, with small private gardens to the street.

In addition to these cultural aspirations and preconceptions about urban form, the range of popular solutions is further limited by the association of innovative forms of construction with building failures. The 'progressive collapse' of the Ronan Point apartment block in 1968 discredited large-panel concrete building systems, whilst a 1983 "World in Action" televised exposé of the misapplication and subsequent failure of timber frame systems all but ended this form of construction in England. These failures were largely due to human error, a misunderstanding and misapplication of the technology, rather than a fundamental flaw in the systems used. Despite this, public confidence in the idea of innovative construction for housing has been undermined, the effect undoubtedly amplified by the special position occupied by the home in the psyche: The potential benefits of homes built using innovative construction cannot hope to balance the perception that these supposed bastions of security might crumble.

In choosing newly built homes the English concern themselves with the "niceness" of the area, the number of bedrooms, the amount of space around the

*Figure 2a: Terraced housing from 1901 (left) and 1995 in Cavendish Street, Dunkirk, Nottingham.*

*Figure 3: 1999 speculative development showing car-centred layout (including "off street" car parking) and narrow spaces between adjacent detached houses*

house, the parking arrangements and the external appearance. A typical advertisement will list location, number of bedrooms, degree of attachment to neighbouring houses (detached, semi-detached, end-of terrace, mid-terrace) and price, in that order. English house buyers are not so worried about space standards; visitors from abroad are often surprised to learn that English home owners rarely know the internal area of their house. Nor is good room layout or spatial interest particularly important, let alone technical information on the quality of the building fabric or services.[12] These factors help to explain the common perception of English speculative housing as "boxy", with small rooms (but many bedrooms), tight entrance halls and circulation spaces, low ceiling heights and small windows (Fig 2a and 2b). They also explain the small and often unusable front gardens (space to park the car off road) and the sometimes ridiculous attempt to make each house detached from its neighbour whilst still keeping site densities high (Fig 3).

When it comes to external appearance the English are particularly conservative, demonstrating a desire to blend in unostentatiously with the surrounding buildings, to have traditional imagery and to use traditional materials. The desire for brick externally is particularly strong, with 94% of the public expressing a preference for masonry construction over timber or steel frame, based on the belief that it is more robust and will hold its value better[13] , and 93% of new housing In 1995 being built with conventional brick/block cavity walls.[14]

This conservatism of taste is not unusual in housing, particularly when the home is viewed as a protective vessel, insulating the occupants from the fast-changing modern world outside. What is unusual in England is the lack of alternatives to traditional imagery in new-build housing; Those who look to continental Europe for examples of more enlightened practice find modern, innovative and popular housing executed alongside more traditional house types as a matter of course, despite their equally fast-changing societies. There may be many cultural

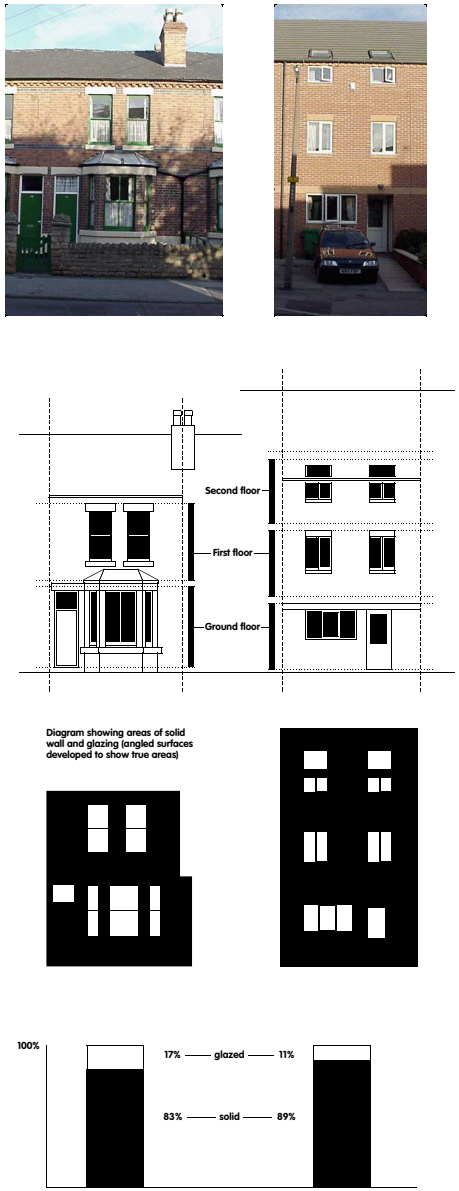


*Figure 2b: Comparitive analysis of ceiling heights and window/wall proportions of terraced housing in Cavendish Street, Dunkirk, Nottingham. Left: 1901, Right: 1995*

factors behind this, the isolation of Britain as an island nation and its suspicion of innovative ideas from abroad, insecurity caused by loss of empire, perhaps nostalgia for rural England caused by population pressure and heavy industrialisation. There does seem to be a strong link, in the English perception, between the image of tradition and a feeling of security, a link that can only have been strengthened by the unpopularity and failure of local authority housing developments in the post-WWII period, many of them executed in a Modernist or even 'Brutalist' idiom. This link seems to be relatively easy to exploit, requiring only a few add-on details to turn a state-of-the art modern house in to a desirable 'Tudorbethan' style residence, but it is equally difficult to escape from. A house that appears modern is treated with suspicion, it is assumed to be temporary and cannot provide the security required of a home. This reliance on image again separates the value of a house from its intrinsic qualities, and burdens the development of new practices in design and construction with the requirement to *appear* traditional.

The consumer aspirations and preconceptions discussed above limit the number of options available to the designers of speculative housing developments, reduce densities and further reinforce a conformity of architectural expression. In addition to limiting choice of house types for the buyer, this in turn significantly increases the complexity of developing in an existing context, where a variety of house types and urban forms is often required to solve the interface between the old and the new. By concentrating on producing a house type that will meet the demands of the majority, the industry has tended to ignore the needs of a significant minority of potential customers, as the rise in the self-build sector and the popularity of 'loft' style apartments demonstrates. In recent years the most commercially successful housing developers have tended to be those with a specialisation, with companies such as 'St George' catering for the needs of the elderly customer and 'Urban Splash' carrying out popular and successful warehouse conversions.

In order to address the needs of a wider market, the house-builders need to understand the needs of its potential customers better than they currently do, but because of the unique status of their product, this is difficult to achieve. Conventional product research methods include 'focus groups' to discuss the advantages and disadvantages of a range of alternatives and 'customer satisfaction monitoring' questionnaires to garner feed back on the product itself. These approaches can lead to product innovation in areas where lifestyles are changing rapidly and products do not already exist , or are obsolete in satisfying changed needs. Unfortunately in the case of housing everyone has experience of the existing standardised product, which tends to limit the imagining of possible alternative solutions. Customer satisfaction research is also problematic in that measures of satisfaction relate solely to expectation; disgruntled customers are produced when the product fails to measure up, happy customers when hopes are exceeded, but in neither case will anything other than current expectations be the benchmark.

The inescapable and unsurprising conclusion from this type of research is that house-builders often find the product they are already producing is what house buyers say they need. Whilst any form of increased contact with the end user is to be applauded, if this contact does not produce pressure to innovate, maintaining the status quo will be a sound commercial decision. Add to this the fact that it is difficult to build up any brand loyalty, and it is clear that there is little commercial advantage in having a product that is unique or distinguishable from the competition. In this situation it is possible to compete without providing a superior product, casting doubt on the claim that house-builders are profitable because they satisfy their customers' needs.

## Discussion

The consensus opinion is that change is urgently required in the speculative housing industry. However there is a complex of factors ranged against any endeavour to introduce innovation, factors which relate to four main areas: The housing market; The regulatory framework; The house-building companies, their make-up and practices; and the client, customer and end user.

The conformity to type of the speculative house building industry's product illustrates that these barriers currently hold sway, however the desire is increasingly apparent to shift this balance in favour of reform. It is by no means simple, and certainly beyond the scope of this essay, to suggest a solution to the difficulty of introducing innovation to the house building industry, but discussion of the relative importance and intractability of the various barriers might help to identify the avenues by which change is most likely to occur.

Of the factors discussed, the most apparently vulnerable barrier to innovation is the client. An increasing level of design awareness and information is being propagated by the mass media, in particular relating to housing and the home. This is likely to produce an expectation that the occupant of a home will become involved in its design and subsequent alteration, whether this is as clients in the increasingly significant self-build sector, or through DIY of varying levels of complexity. Improving communications and travel opportunities, and an increasingly multicultural society, are ensuring that the English are exposed to an ever greater variety of cultural influences. A reduction in the availability of green-field development sites and efforts to redevelop redundant industrial areas are refocussing attention on the English city as a dwelling place. This is a context in which the standard speculative developer's "box" is more obviously an unsatisfactory solution, and where non-traditional forms and aesthetics gain more widespread ac-

ceptance. The net effect of these and other factors is to increase familiarity with alternatives to the standard English speculative house, which in turn produces a greater demand for choice in the market place.

This demand for alternatives translates into a commercial opportunity for specialist housing providers who are prepared to occupy a niche market, and many of the large house-builders are creating subsidiary companies with distinct brands to offer. This response to the market typifies the commercial imperative on the major house-builders to provide returns for their shareholders. In the absence of demand from the consumer for an innovative product, this imperative is probably the major barrier to change in the English market. Where a commercial incentive to reform practice does exist independently of consumer demand, for example in improving the efficiency of construction methods, this will be subjugated to the need to produce a desirable product. This can be seen in the practice of surrounding frame-structured housing with a self-supporting skin of traditionally built brick in order to produce a traditional image.

Previous attempts to promote change have under exploited the link between the two aforementioned barriers to innovation, the client and the commercial nature of the housing providers respectively. If a demand for choice and innovation is forthcoming from the consumer, then the commercial house-builder will react by altering their product to suit. House-builders are improving their ability to monitor and react to consumer demand, but unlike other product manufacturers as yet seem to be ignorant of their ability to influence it. The consumer is increasingly accessible to the producer through the proliferation of information media, and their opinions and attitudes are ever more likely to be influenced by these media than by tradition. There may well be an opportunity for a house-builder with an innovative product to create demand through effective advertising.

The very strong connection between private ownership of housing, personal investment and the mortgage market seems unlikely to change. This can be illustrated by envisaging the possible consequences of suddenly making mortgages unavailable: current house prices would be unsupportable, and would eventually drop to a level within the immediate means of the purchaser, rather than the multiples of annual salaries that they currently represent. The economic consequences of this would be dire: as well as the loss of an entire mortgage industry (and that industry's investment in other ventures), existing mortgage holders would find their major investment rapidly converted into debt as prices fell. The housing market responds to and amplifies changes in the wider economy, encouraging innovation-limiting volatility, but there are too many vested interests in maintaining the status quo for significant changes in this system to be likely.

The obvious alternative to home ownership, the rental market, is currently less popular in England than elsewhere in Europe. As job mobility increases and the nuclear family becomes less common, this option might be expected to become more attractive, but not until rental prices fall in comparison to mortgage payments, and choice in the sector improves. If rental does become more common, an area of opportunity might arise in purpose-built housing intended for rental, creating a body of clients that would have more in common with social housing sector clients than the usual speculative house buyer. Having a longer term interest in the property they will be more concerned with build quality, adaptability and, arguably, a distinctive image. They would also be a more informed, focused and identifiable client body for house-builders to work with, a situation that would more successfully foster innovation in speculatively built housing.

The regulatory framework to the housing market has both positive and negative effects on the drive to encourage innovation. Whilst more stringent building regulations force house-builders to innovate, particularly in energy efficiency and

accessibility, planning regulations are widely regarded as placing a time-penalty on innovative development and encouraging convergence to an accepted aesthetic. A limit to the range of acceptable design solutions will also limit the development and effective implication of innovative technologies. The thorough application of new construction systems, for example, will almost inevitably produce an unfamiliar aesthetic. Because of the pressure to conform to aesthetic norms, research and development efforts in systems intended for the English housebuilding industry is concentrated on reproducing the appearance of a traditionally built structure. Two alternative, and potentially more productive, approaches would be to focus on developing more flexible systems that allow design freedom, or to allow and encourage the refinement of new (and equally popular) architectures. Neither solution will be possible if a single aesthetic and urban form is enforced by the planning system.

Some change to this situation will be necessary if the demand for new homes and the Government's targets for brown field housing are to be met, but a sea-change in attitudes, particularly towards design, seems unlikely in the short term. The difficulty of producing "official" design guidance that is not only sufficiently comprehensive and comprehensible in nature, but also both open-ended and applicable, make this one of the more intractable obstacles to innovation in housing. More successful than attempts to produce such official guidance might be a general shift in attitudes towards innovative housing solutions, but this too is hampered by the current situation: whilst attitudes within the planning system might well follow the public lead, the system itself restricts public opinion by reducing exposure to alternatives.

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