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Office vs. Residential: The Economics of Building Tall



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James Barton is a Director within the London Commercial Real Estate and Residential team at Davis Langdon. Since joining Davis Langdon as a graduate over eighteen years ago, James has spent the majority of his career focusing on the leadership and delivery of complex residential mixed-use and commercial schemes, including working on a significant number of high-profile tall buildings globally. James' understanding of the key success factors and design related cost drivers, particularly on tall buildings, combined with his work as a member of AECOM's tall building group, enable James to provide expert consultancy advice to clients around the world.

Steve Watts

Steve Watts led Davis Langdon's and AECOM's global tall buildings groups for several years, combining a passion for research and innovation with a hands-on approach to projects. His CV includes landmark buildings from the HSBC Headquarters at Canary Wharf to the Shard at London Bridge and the Leadenhall Building in the City of London – as well as a number of international commissions.

Steve is a trustee of the CTBUH, UK Country Leader for the Council and heads its Finance & Economics Working Group. From May 7, 2013 he will be part of a new venture that focuses on excellence in cost consulting: Alinea Consulting.

When it comes to tall buildings in London, the sky's the limit, and not necessary in terms of height. With rents among the highest in the world and investors eager to see strong returns, the incentive to maximize floor plates, as well as the diversity of uses, has never been greater.

Introduction

London: Capital of Asia? That was the provocative title of a debate held at MIPIM in early March this year, the annual jamboree of the property industry in Cannes, France. It was prompted by the significant flows of foreign money that have been pouring into London in recent years, as the UK's capital benefits from its sophisticated market, quality of product, status as a leading financial center and the inherent advantages of its location, time zone, legal system, and relatively stable political environment. "It is a safety deposit box" for international investors, Peter Rees, the City's Chief Planning Officer has commented.

Lack of residential stock is fueling demand too, which, combined with high land prices, is the reason why high-rise living (and investment in it) is becoming increasingly popular. As Matt Oakley of Savills says: "People are prepared to pay to own a piece of one of London's towers, and the recent completion of The Shard has whet the appetite of investors for building upwards."

While the array of new residential towers has been getting much of the headlines in this respect – with reports of developments such as Battersea Power Station selling their substantial available lots off-plan to predominantly Asian buyers in a matter of days – most landmark commercial towers in central London enjoy majority overseas backing. A Savills study has suggested that in central London 44% of new-build residential developments are purchased from Asia; the comparative figure for the office market is 24%, a significant number itself.

The Central London offices market is by far the strongest performer in national terms, with capital values supported by this foreign investment. The prime residential market in London has resisted the volatility in demand

and price stagnation that is evident elsewhere in Greater London and the rest of the United Kingdom. It has seen not only extraordinary price increases (30% more than elsewhere in the capital) but also an expansion beyond the traditional prime districts of Knightsbridge, Mayfair, and Belgravia into new areas along the South Bank of the Thames and further afield. Residential values in London are now amongst the highest in the world, fueled by this foreign investment and limited supply. Many inner London schemes are achieving £1,000/ft² (£11,000/m²) sales now – considered a "prime" value not that many years ago. At the other end of the scale, super prime achieves between £2,500 and £5,000/ft² (£27,000 and £54,000/m²). But it does not stop there: Candy and Candy's One Hyde Park reportedly topped the £7,000/ft² (£75,000/m²) mark, and high-end "specials," like the apartments at the top of the Shard at London Bridge will surely be striving at values towards this peak.

Given all this, and the fact that a large majority of purchases tend to be in cash, it is not surprising that the portfolios of many London developers include proposals for high-rise, high-value residential towers. And with office values, in real terms, no different to the levels they attained some twenty years or so ago, there are a number of office-led developments that are incorporating a residential element, sometimes in the same building, creating a new typology of mixed-use tower.

Rewind a decade or so, and not only was the residential landscape quite different, but the tall commercial scene was almost unrecognizable compared to today's changing skyline. It is easy to forget the heated debates and polarized views surrounding the appropriateness of tall buildings in London, largely in terms of office tower proposals. Heron Tower led the way with its difficult passage through a public inquiry, but the Gherkin still courted controversy, with UNESCO worried about its impact on St. Paul's

Cathedral, and the Shard had to negotiate its own public inquiry. Now they are being joined by other landmarks like the Leadenhall Building and 20 Fenchurch Street, not to mention a host of other proposals both in and outside the public realm, and the time, expense, and risk involved in such challenging projects is repaid (it is hoped) by the value of increased floor area on constrained plots, high-quality buildings, imaginative forms and a variety of floor plates. Tenants will no doubt appreciate all this, as well as the view, the attraction and retention of staff, the address, and the sharing of a high-quality infrastructure with other like-minded organizations.

The Value of Height

There are a number of drivers for tall building development, from city competition – sometimes encouraged by governmental incentives, as is evident in the Pudong and Canary Wharf enterprise zones of Shanghai and London, respectively – to sheer ego. But almost without exception, towers are built equations founded on the development appraisal at its most fundamental: value less cost equals profit – whether they are commercial office or residential apartments. Maximize the residual by increasing the former, and/or reducing the latter, and your developer is contented.

While the principles across high-rise offices and residential are consistent, the two sectors can appear to be divided by a common language at times. Their values are driven in different ways and the resulting products are characterized by quite different building forms.

For starters, the correlation between value and cost tends to be stronger in the residential product. Knight Frank's *Tall Towers 2012* reinforces this view: "In terms of height, the general rule is, the higher the apartment, the greater the price premium. This not only reflects the enhanced views, but also the increased exclusivity of living towards the top of a tall tower." This report goes on to suggest that the typical uplift in value per square foot, per story is 1.5% (excluding penthouses).

Such a correlation is less clear in the commercial offices world. Rental figures for a certain established landmark tower suggest an increase in rental levels higher up the building, but a number of agents have remarked that the lower floors were let first, and by the time the higher levels were negotiated, there was a premium attached to their exclusivity as well as a general uplift in the market. Lies, damned lies and statistics. There can be little doubt that a tall office building attracts a premium of some nature, but articulating what that is, and how it relates to particular levels, would seem to be less than straightforward.

Enhancing that Value

Traditionally, the office product does not really change with height. While residential developers will alter the floor plates and size of apartments on the highest floors, locating duplex or even triplex penthouses there to underpin the price premium, the office floor plate tends to be less differentiated. Planning and architectural influences may drive a tapering or reducing form, which lends itself to more boutique operations or executive functions, but the marginal value of this element of the office tower is less tangible – certainly at concept stage.

Value in both sectors will, of course, be partly determined by good design, specification, and detailing, as well as natural attributes like location and views. But the residential developer has a box of other tricks to play with, which can enhance the value and saleability of the product, such as: balconies and winter gardens; generosity of space and volumes;

pavement-to-door "look and feel," brand association; and amenities such as members' club, spa, childcare center, concierge facilities, etc.

The Cost of Creating Value

There may not be an exact correlation between sales values and fit-out costs in residential developments. Each scheme will introduce its own idiosyncrasies as marketing strategies or differentiators. However, there is a general trend that demonstrates a relationship between the two key drivers (see Figure 1).

As a rule of thumb, apartment fit-out costs equate to about 10% of sales values (above a sales value of £1,000/ft² or £11,000/m²). As with all rules of thumb, this is open to challenge, but the fairly tight range displayed in Figure 1 does give this some credence. That said, there are ways to underpin value by creating a quality product in more cost-effective ways – for example, through smart-sourcing of components and intelligent procurement.

The value and cost of fitting out is much less of a consideration for office developers, whose focus is on the shell and core building (and base build definition). Value is largely derived from the amount of space that can be squeezed onto a plot within the constraints of planning and aesthetics, and the quality of that space is a factor – but arguably with less consideration of usability. London and the United States represent an interesting counterpoint in this respect: the landmark towers of Central London are moulded within and between viewing corridors, rights of light

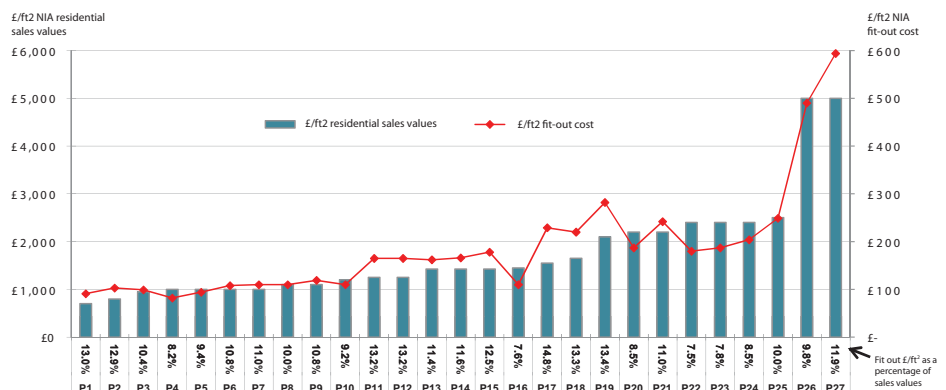


Figure 1. Comparison chart between apartment sales value vs. fit-out cost. © AECOM Davis Langdon

“Almost without exception towers are built equations founded on the development appraisal at its most fundamental: value less cost equals profit.”

and others intrusions, while being crafted to be architectural statements. In New York City they have generally been designed more from the inside-out, starting with an ideal core-glass dimension to enable efficient space planning for potential tenants. There is evidence that these approaches have begun to change in both locations.

The Financial Challenges of Reaching for the Sky

Towers of whatever nature present a number of fundamental challenges, but the taller, more complex, more constrained and sensitive incarnations present higher hurdles in terms of the “regulatory tax” of the town planning process. The need to satisfy a number of interested parties, not to mention secure finance on appropriate terms, takes a lot of time and effort. This costs money and creates uncertainty, not only in forecasting future costs, but also in predicting the letting market several years down the line. It may even predict one or two property cycles, (hence the now infamous Skyscraper Index).

The larger towers can be massive engineering projects, crafted over many years, exposed to political risk, forming part of the infrastructure network and involving eye-watering financial commitment.

Larger towers inherently cost more to build (per unit of floor area), take longer to bring to site and construct on site, and are less efficient in net-to-gross floor area terms. No matter what the building use, the fundamental measures that underpin tall building viability are cost, time and floor area efficiencies. Both

office and residential towers have to address this “golden triangle” of financial challenges of high-rise development. The inter-relationship is complex, but critical to the success of the project, the challenge being to squeeze every possible gain out of each (although a gain in one will often result in a loss in another).

Not only is there a marked difference in the value profile of office and residential tall buildings, but their cost build-ups reveal very different profiles too (see Table 1). These “typical” high-rise costs show the relative build-ups in shell and core costs, together with the very different fit-out costs, the marked differences in some elements the result of a diverse product (with a more detailed explanation beyond the scope of this article).

With fit-out costs included, the total construction costs of the two building types are within 10%. But their respective value profiles could be quite different, with the residential tower in particular possessing a large value range, depending on, among other things, its location, views, etc. The residential tower in this cost build-up assumes average sales values of around £1,500 per square foot (£16,000 per square meter), whether this could be achieved in the City of London is a moot point, given planning constraints. However, a super-prime product in the right location will exceed this. The prime office tower, by comparison, could struggle to compete with super-prime residential values. However, new towers scheduled for the next couple of years are quoted as achieving annual rental value of £55–70/ft² (£80–110/m²), which a recent

Shell & Core elements	Typ. residential tower (£/ft ² GIA)	Typ. office tower (£/ft ² GIA)
Substructure	8	20
Superstructure	33	45
Façades	60	52
Internal walls, finishes & fittings	11	23
MEP services	21	42
Vertical transportation	5	18
Contractor’s preliminaries, profit, contingencies	37	50
Sub-total: shell & core costs	175	250
Fit-out costs (developer’s standard)	120	27
Total including developer’s fit-out	295	277

Table 1. Typical London office and residential elemental costs compared (both shell-and-core and fit-out). © AECOM Davis Langdon

Cushman Wakefield report states as “significantly outperforming prime rental values in the City.” With an assumed yield of 5%, this would equate to a capital value of between £1,100 and £1,400. Of course, affordable housing provisions (or commuted sums) is a further factor to be considered in the comparison.

High-rise office cost drivers tend to stem from a scheme’s shape, not least because it has a profound effect upon the structural solution together with the cost of the façades (because of the extent of the external walls, as expressed in the scheme’s wall-to-floor ratio). The superstructure costs and façade costs of a tall office building are crucial: these two elements represent the greatest height-related increases and they also show a vast range of potential costs, because of the array of architectural and engineering solutions that is evident in London’s developing skyline.

The residential tower will have its own particular areas of focus, such as the incorporation of balconies and different approach to plant location and servicing strategy, but shape is the most important driver of cost in any tall building, from the size and profile of floor plates (and their story heights) to the vertical arrangement of floors.

With offices there is an intense and sometimes political relationship between high-rise aesthetics and performance, which is no more evident than in the façades. The form and envelope of an office tower create its identity, and its external walls play a crucial role in its

passage through the town planning process. They also have to satisfy a number of performance criteria, one of which is cost.

The wall-to-floor ratio reflects the quantity of façades; its specification and complexity will determine its elemental cost. Marry the two and you have a potent mix that can either make or break the scheme's viability. An expensive façade allied to a shapely, articulated tower can produce a façade that is three times the cost of a simpler solution on a more regular tall building. For a "typical" landmark office tower in central London, this difference can equate to tens of millions of pounds.

The envelope of a residential tower is of course also important, but the focus tends to be on the effective incorporation of balconies, from *juliettes* to inset balconies (or winter gardens) and the value/cost equation of each of these options. With planners' demands for double-aspect apartments, careful use of articulation means that these requests can be met while driving value upwards.

Similarly, its structural design is usually based on the well-trying concept of a central concrete core with shear walls that double as apartment walls, and concrete slabs that address acoustic, height and span requirements cost-effectively. The concept of a central concrete core is also the most cost-efficient one for office towers, but for various reasons it is just one of a number of solutions evident in Central London.

Common Metrics

Wall-to-floor and net-to-gross are the two ratios on which cost consultants feed. And with good reason, because these two numbers, more than any other, succinctly provide clues to the viability of a tall scheme, whether office or residential.

Wall-to-floor ratio expresses the quantity of external walls per unit of floor area and thus is a critical measure of cost efficiency. London office towers cover a wide spectrum of designs, both in terms of conceptual shape and articulation and specification of the envelopes.

This array of shapes produces not only a large range of costs but a considerable range of wall-to-floor ratios; indeed, the latter goes a long way to determining the former. Wall-to-floor ratio is the principal implication of shape, representing the amount of wall area that has to be constructed for every unit of floor area, so from a cost perspective, the lower the better.

A comparison of Asian and London towers provides an interesting contrast (see Figure 2). One could debate the architectural merits of each and every one of these buildings for some time; they are all tall landmarks. But they possess very different wall-to-floor ratios. The projects from the Asia-Pacific region all score between 0.30 and 0.35, compared to a range in London of 0.35 – 0.60 (with the majority 0.45 and above). This is because the Far East buildings have larger, more regular floor plates, with centrally-located cores. The London floor plates reveal a "sushi" selection of sizes, forms and configurations, many of which alter as the building rises.

Therein lies one of the challenges to developing high-rises in historic locations: the impact of small, irregular and constrained plots, married to various influences in the sky, from viewing corridors to rights of light, all of which determines form, horizontally and vertically.

This is one of the reasons why it is difficult to provide rules of thumb for cost versus height questions – but also the reason why understanding (and following) the conditions for success is crucial, from creating the right form to focusing (persistently) on the detail and the opportunities presented by economies of scale. Cost savings are multiplied many times over where they are applied to components or details that occur

throughout the building, additionally meaning that money can be concentrated on exceptional areas that help to create differentiation and "delight."

Floor Plates Compared

The size, shape and form of the floor plate are among the largest contributors to success. A tower's form and slenderness ratio influences architectural, structural and servicing strategies, in addition to more fundamental design economics, such as net-to-gross ratio and wall-to-floor ratio, which have a more direct bearing upon viability and development returns.

To ensure optimum residential design efficiencies in London, a minimum optimum threshold for efficiency in the key metrics (net-to-gross and wall-to-floor ratios) is a floor plate of at least 600–650 square meters. However, sometimes a smaller floor plate can be made to work if the development density can be increased sufficiently (see Figure 3). Other markets are characterized by different forms. For example, locations within the Middle East demand larger apartments, creating deeper floor plates.

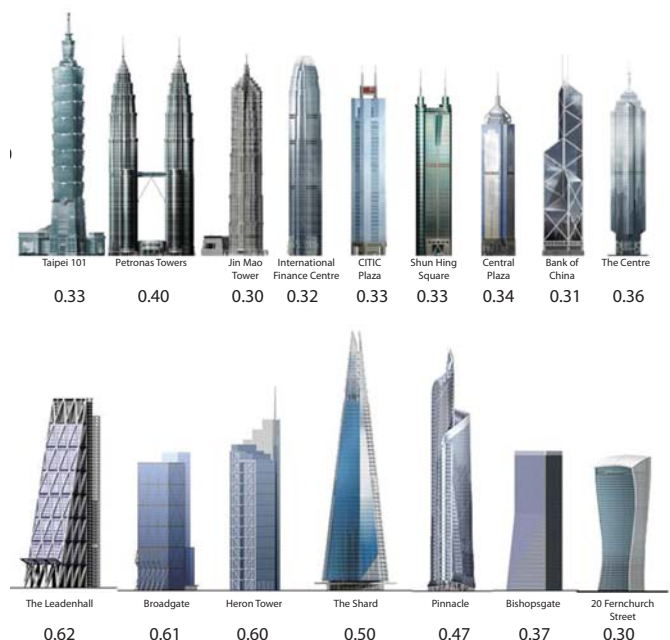


Figure 2. Comparison of the wall-to-floor ratio between London vs. Asian towers. © AECOM Davis Langdon

When considering residential floor-plate size, it is critical that the depth is maximized in order to mitigate the slenderness ratio, thereby improving net-to-gross and wall-to-floor ratios, but this needs to be carefully balanced with layouts and daylight factors, or it may have a detrimental effect upon sales values.

Office layouts are subject to fewer conflicting constraints, but they are nonetheless characterized, in London anyway, by an array of sizes and configurations. The associated floor plates of the London towers, shown in Figures 2 and 4, demonstrate this. And yet floor plate size is also crucial to high-rise office cost and area efficiencies, with something like 1,700 square meters an average minimum target to avoid an adverse effect on the key metrics.

The façade of a residential development will constitute a significant proportion of its overall cost, so it is important to achieve an efficient wall-to-floor ratio. The determining factor in wall-to-floor ratio is therefore a maximized floor plate size, while minimizing articulation, although this may be an issue in some tall

schemes where inset balconies or winter gardens are incorporated into the design.

The layout of apartments by floor also forms one of the critical cost drivers. And by maximizing the number of apartments per service core, the shared costs (stairs, lifts, risers, etc) are reduced per apartment, which will in part, drive the viability. In luxury developments, the need to maximize apartments per core can however, produce a paradox, as the reverse is more typical, where exclusivity and privacy minimize the ratio of apartments per core.

In both cases the need to comply with escape distances, and building and fire regulations, as well as daylighting and the marketing requirements to maximize external views and the number of aspects, will also drive floor plate design.

The mix and size of apartments can also have a significant bearing on floor-plate design. The density of apartments can affect the sales values, which tend to be higher for smaller units, which are more aligned with the investor market. Such apartments require more

servicing, and can be more difficult to access from a centralized core, without losing further saleable floor area to circulation.

The assessment of the structural and core layout on a residential floor plate will need to be analyzed in order to maximize the saleable areas. A centralized single-core option will be the most efficient design solution; however the strategy and ratio of core, lifts and stairs will have a bearing on the costs and maximization of sales areas.

The effect of single- or double-loaded cores also has a fundamental impact upon the net-to-gross efficiencies, in addition to the wall-to-floor ratios. Through the implementation of single aspect apartments located either side of a core/corridor, the net-to-gross efficiencies (and the consequent viability) can be maximized, while maintaining a cost-effective wall-to-floor ratio.

The focus in office towers is in optimizing net-to-gross through the early development of a tight core, with an optimized vertical transportation design and plant/services distribution strategy, among other things. The preferred option will be a best fit across cost and space take results.

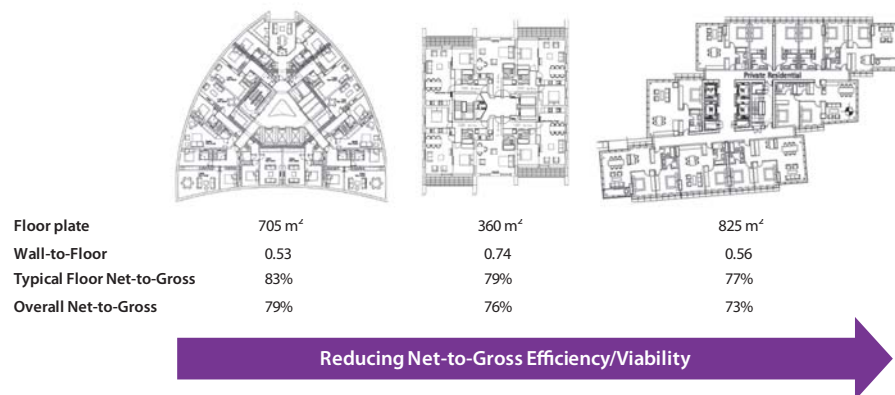


Figure 3. Residential floor plates and efficiencies comparison. © AECOM Davis Langdon

Height and Efficiency

Both residential and office towers are less efficient than shorter buildings because of the size of the structure required to deal with wind loads in particular, the increase in core area taken by plant/services distribution systems and the greater number of elevators, with associated lobbies and circulation. While these principles and their effect on efficiencies are consistent across building types, the numerical effects vary.

Above-ground efficiencies in offices suffer with height, but as with cost, the range is considerable – and is driven just as much by size and regularity of floor plate as it is by height (see Figure 5).

Crucially, with residential towers, the relationship between core and floor-plate size is

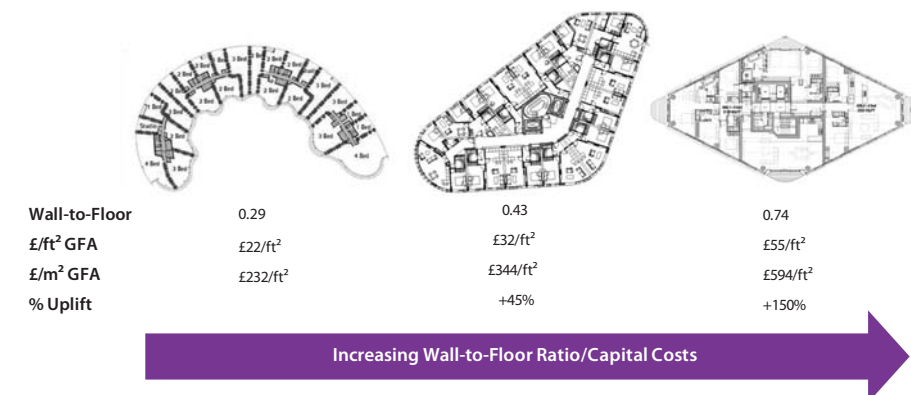


Figure 4. The impact of floor plate shape upon wall-to-floor ratio. © AECOM Davis Langdon

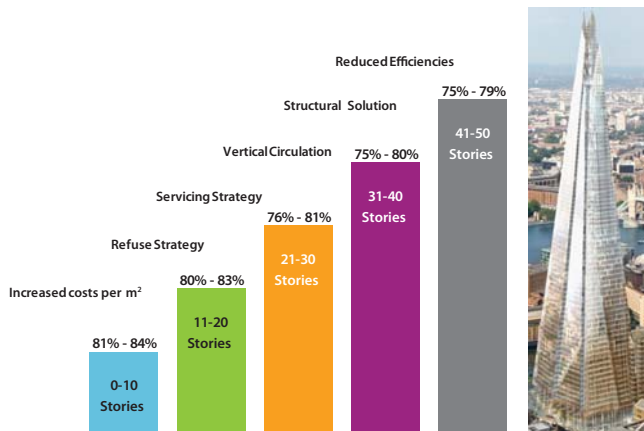


Figure 5. Office low-rise and high-rise efficiency comparison. © AECOM Davis Langdon

limited, albeit that core sizes inherently get larger as building height increases, while floor-plate size diminishes and slenderness ratios increase. The resultant effect tends to highlight the reduction in net-to-gross ratios. This is further diminished by the introduction of intermediate plant floors, which are typically introduced every 15 to 20 stories.

The Future

Striving for landmark status tends to be more of an issue in commercial office towers (or mixed-use variants). There's certainly a value in icons, some elements of which can be difficult to quantify, but equally can be clearly seen in buildings such as 30 St. Mary Axe (the Gherkin). A tower's concept can, and indeed should, drive more tangible value: the Leadenhall Building's investment in its mega frame creates large floors that are largely uninterrupted by internal columns; The Shard's tapering form lends itself to its mix of uses and enables a very efficient structural solution.

However, a city can accommodate only so many icons, and the challenge remains to make the rest of the building stock effective, and to extract value out of existing buildings. In commercial high-rise terms, London is now probably in a new development phase, with an emphasis on elegant but rational forms – the savings from which can be invested in a combination of more competitive rents and better internal spaces.

It should be argued that money be re-directed into areas that are more valuable to occupiers,

which impact the well-being and productivity of their people and the long-term performance of the asset. If less can be spent on the structure and façades without compromising quality, why not direct some of these savings into comfortable, flexible and interesting environments? Considerations such as an increase in ceiling heights and double-height space can help to produce a sustainable, differentiated product.

Residential developers are becoming more experimental too. A recent IPINGlobal report states: "In some cases, floor plates and designs are being changed to create apartments across a whole floor... However, as high-rises become more adventurous, consumers are asking for more, including higher specifications and ease of access, such as private, super-fast lifts. This means that investors looking to capture high-end markets must seek out the highest towers and the bravest designs."

The tall residential market has arguably even more reason to look beyond these shores in its readiness to absorb new ideas and initiatives, such as:

- The American PRS route – using penthouse levels to generate amenities like private members clubs, rooftop gardens and pools.
- Greater flexibility to internal fit-out, even internal arrangements – aided by new methods of construction.
- The Japanese genealogy route – increasingly expensive ownership may result in properties being passed down through generations, which may necessitate creating flexible and dynamic space that can accommodate

“A city can accommodate only so many icons, and the challenge remains to make the rest of the building stock effective, and to extract value out of existing buildings.”

younger generation, as well as the more venerable/retirement bands, from a branding, layout and amenity base. This may also extend to selection of materials, which may need longer life expectancies due to “multi-generation” mortgages.

- The destination – more focus on the target market for location and purchaser traits, including specific accommodation requirements of overseas purchasers.
- The integration of intelligent technologies into residential living.

While there are a number of drivers for tall building development, and global cities continue to create landmark towers to signpost their increasing prosperity, there are developers in locations around the world who are very interested in these principles in both sectors, and who are looking to establish valuable tall assets in the most efficient, innovative and cost-effective ways possible. And in the process, they want to learn lessons from London's current crop of towers, and our latest thinking for the next generation of tall buildings.

London, and those involved in its incredible tall-building development over the last decade or so, is now giving as much in terms of knowledge as it is taking. And long may the flows of learning, inward and outward, continue, to ensure that the tall-building typology, whether office, residential, mixed-use or some other variant, progresses to ensure that it addresses the challenges of high-rise working and high-rise living in a world that is very different and which will continue to change. ■