Vertical phasing as a corporate real estate strategy and development option

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Abstract

Purpose – The purpose of this paper is to demonstrate the potential value of significant vertical phasing – that is, the addition of five or more stories to an existing building – as a valuable real option in real estate development, in particular for corporate real estate strategy.

Design/methodology/approach – The demonstration is done through in-depth case studies of four major projects in North America: the 24 story, 880,000 square feet expansion of the Health Care Service Corporation building in Chicago; the Court Square Citicorp Campus in New York City; the Bentall Five project in Vancouver; and the Tufts University School of Dental Medicine building in Boston.

Findings – Vertical expansion appears to have significant organizational and logistical advantages for corporate developers, such as the ability to keep staff in one building, and the elimination of the need to relocate with its resulting inconvenience and potential to lose employees. Further, the financial analysis indicates that the option to expand vertically is a reasonable way for corporate developers to access convenient expansion space, while limiting their downside risk. Commercial developers on the other hand may find that the ability to scale back designs in the case of market downturns is particularly valuable. The case studies also confirm by example that the vertical expansion of buildings is technically possible. Although the process of erecting a major new building on top of a fully occupied building is clearly complex, it is not extraordinary difficult so long as the possibility of vertical expansion is built into the original design.

Originality/value – Vertical expansion of buildings has not been appreciated as an attractive feasible option for flexible development of real estate in a risky environment. These case studies and analysis bring this possibility to the attention of the real estate industry and corporate real estate managers.

Keywords Real estate, Corporate strategy

Paper type Case study

Journal of Corporate Real Estate
Vol. 11 No. 3, 2009
pp. 144-157

1463-001X
DOI 10.1108/14630010910985904

The authors would like to thank the HCSC vertical completion project team in Chicago, Citigroup, and Tishman Speyer in New York, Bentall Capital in Vancouver, and to the Tufts University team in Boston, for their cooperation and encouragement of the research that supported this work. The MIT Center for Real Estate provided catalytic professional and intellectual support. The authors are also grateful to the reviewers who helped us refine and sharpen the presentation.

1. Introduction

The potential value of significant vertical phasing – that is, of constructing first a shorter building and then adding significant expansion later by increasing the building's height – has not been appreciated as a valuable real option in real estate development. Books on flexible architecture seem to ignore the possibility (Kronenburg, 2007). Most professionals know of buildings that have added an extra floor or so to an existing building, but few seem to be aware of the possibility of major vertical phasing. This article reports on a series of case studies of successful vertically phased projects, and suggests when and how vertical phasing might be valuable to developers.

The article first summarizes the case studies and then discusses what these examples might teach us about the important aspects of vertical phasing: its technical feasibility, the associated planning issues, its overall value, and its most likely sponsors – which appear to be corporate real estate developers. The overall take-away is that vertical phasing, properly planned, can be an attractive option, perhaps especially for corporate developers wanting space for their own use.

2. Examples

A team from the MIT Center for Real Estate assembled and analyzed the case studies. Their detailed reports can be found in two theses easily accessible on the web (Guma, 2008; Pearson and Wittels, 2008). They examined four current or recent major vertical expansion projects. These are located in Chicago, New York City, Vancouver, and Boston. These do not constitute the whole catalog of vertical expansion projects; others exist such as smaller projects reported in Canada (Sorensen, 2007) and in the USA (Bullard, 2008) and no doubt elsewhere worldwide.

Chicago

The Health Care Service Corporation (HCSC) headquarters building is in downtown Chicago, across from Millenium Park (Plate 1). The initial phase of 30 stories above ground (plus three below ground) was completed in 1997 as a new headquarters for the company. Upon completion of the vertical expansion, scheduled for 2010, the building will contain 54 stories above ground. Depending on internal growth at HCSC, the building is anticipated to remain primarily a single tenant building. Goettsch Partners was the architect, and Walsh Construction the construction manager of both phases.

Several factors motivated HCSC's decision to plan for vertical phasing. The corporation wanted a downtown site for a building that could house its entire staff, convenient to rail access from the suburbs so that it could retain and support its workforce. Thus, it wanted a single building but in the 1990s did not want to commit to what it might need in the 2010s and beyond. HCSC thus designed the building with the flexibility to expand when needed, and exercised this option a decade after the first phase was finished.

New York City

Court Square Two is part of the Citigroup Campus located one subway stop from midtown Manhattan in Long Island City, Queens (Plate 2). It stands next to Court Square One, a 1.5 million square foot facility home to approximately 5,500 Citigroup employees. Phase I of Court Square Two, completed in 2007, is 15 stories high, contains 490,000 gross square feet and can accommodate approximately 1,800 employees.

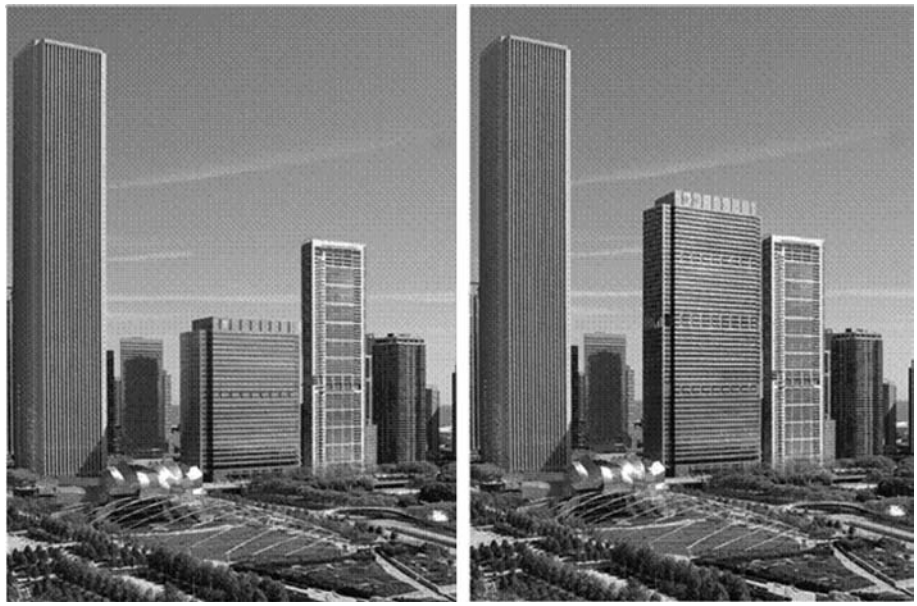


Plate 1.
Health Care Service Corporation building in Chicago in center of image

Note: Phase 1 (left) and Phase 2 (right)
Sources: Goettsch Partners (2008); Pearson and Wittels (2008)

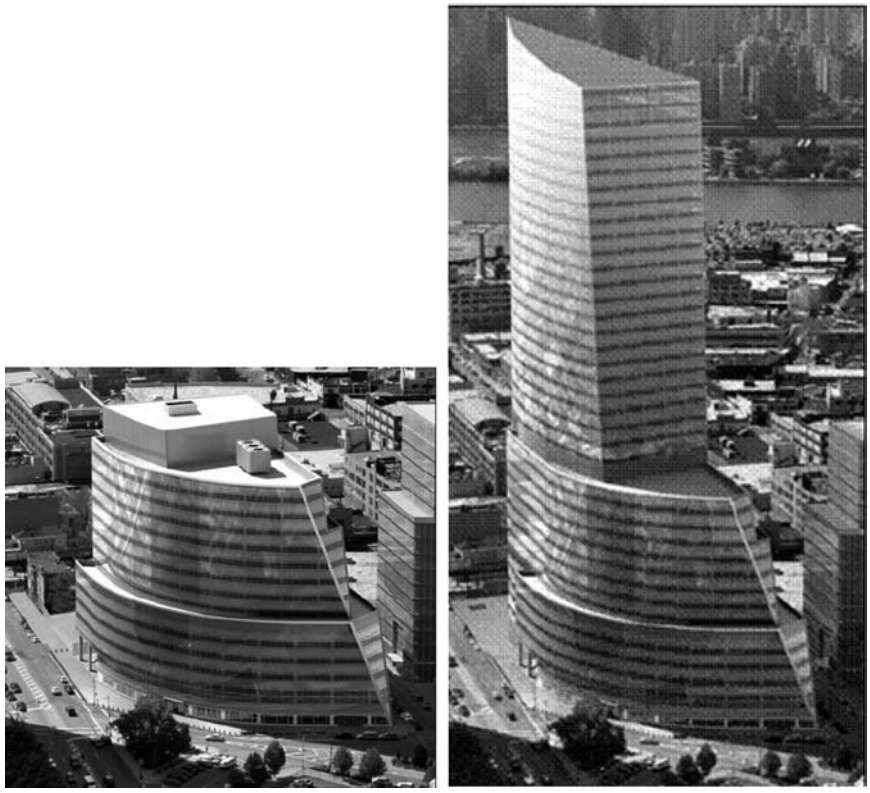
It achieved a Gold LEED certification and cost approximately $175 million to construct, including a required subway improvement. Tishman Speyer was the fee developer on the project, Turner Construction the construction manager and Kohn Pedersen Fox the architect.

As with all of the cases examined here, Phase I of Court Square Two was designed to function as an efficient independent building if the building were not expanded. Phase II would expand the project both horizontally and vertically to 1.4 million gross square feet on a total lot size of approximately 79,000 square feet. It would then house more than 4,500 employees, a training center, employee cafeteria and a retail bank. The horizontal expansion could extend the 15 original floors, enlarging their center core floor plates from 39,700 to 66,500 gross square feet. The vertical expansion option would increase the building from 15 to 36 stories. The total development cost for both phases is anticipated to exceed $500 million (excluding land costs).

Vancouver

Bentall Five is part of the two million square foot Bentall Center, the largest collection of class A office space in Western Canada (Plate 3). It is a multi-tenant building developed by Bentall Capital, a large Canadian commercial real estate developer. The Musson Cattell Mackey Partnership designed the building.

To mitigate market risk, Bentall Five was designed to be built either all at once or in two vertical phases. When construction began in March 2001, the plan was to build the entire 33 story tower. However, January 2002, based on analysis of market conditions, Bentall Capital exercised the flexibility built into the design, and elected to construct only the first 21 floors or approximately 330,000 rentable square feet. This Phase I was



Notes: Phase I (left) and Phase II (right)
Sources: Kohn Pedersen Fox (2005); Pearson and Wittels (2008)

Plate 2.
Court Square Two in New York City

completed in September 2002 with floor plates of approximately 17,000 rentable square feet. Construction of Phase II began three years later and tenants were able to occupy it in 2007. Phase II contains 13 floors and approximately 230,000 rentable square feet. Its floor plates are slightly larger at 17,700 rentable square feet, due to the absence of lower level elevator shafts. The complete Bentall Five nominally has 34 floors (with no 13th floor) and contains approximately 560,000 square feet.

Boston

Phase I of the Tufts University School of Dental Medicine building was completed in 1973. When the building was being planned in the late 1960s, the school identified a need for a 16 story building at the site, but had neither the program to support nor the funds to build the structure to its fully intended and approved height. As a result, Tufts only built 10 stories. However, it was interested in extending the building to its full height at a later time, and therefore designed it with the capacity to expand (Plate 4).

Tufts decided to exercise its option to expand the building in 2007 by adding five additional stories (rather than the planned six, due to code changes). This vertical expansion involves an additional 105,000 square feet, bringing the area of the

Plate 3.
Bentall Five building in Vancouver

Notes: Phase I (left) and Phase II (right)
Sources: Bentall Capital (2005); Pearson and Wittels (2008)

completed 15 story building to about 283,000 square feet on a footprint of 21,000 square feet. One floor will be shell space to be fitted out later. The expansion is scheduled for completion in November 2009. Construction costs of the original building are unknown. The vertical expansion has a total project cost of $66.5 million, which consists of $13.5 million in soft costs (such as fees for architectural, legal and project management) and $53 million in hard costs, of which $47 million are attributable to the vertical expansion and $6 million to upgrading life safety elements located in the original ten-story building. The Architect's Collaborative, designed Phase I and Barr and Barr was the construction manager. Architectural Resources Cambridge (ARC) designed the expansion and Shawmut was construction manager. LeMessurier served as structural engineer on both phases of the project.

Sources: Architectural Resources Cambridge (2008); Pearson and Wittels (2008)

Plate 4.
Rendering of five story expansion of Tufts University Dental School

3. Technical feasibility

The case studies document the fact that vertical expansion is technically feasible even for massive projects such as the HCSC building in Chicago. The difficulties in vertical expansion are different from but not particularly harder than those associated with building on an empty lot. As one of the construction managers told us, echoing other reports we had read, vertical expansion can be faster and easier because it does not have to worry about excavations, dewatering processes and associated environmental issues, and the construction of foundations.

Vertical phasing does of course, have its special moments. Hoisting steel girders up past 30 stories of plate glass offices in Chicago, notoriously the "Windy City," does require special attention, particularly as the earlier, lower phase must continue in full occupancy and usage during the second (upper) phase construction. Protection against falling objects is especially important when the buildings are continuously occupied. The construction managers have to be particularly careful about how construction materials and workers access the site, and when they schedule particularly noisy activities. The web site for the Bentall Five project (Bentall Capital, 2008) describes these concerns in detail.

Careful design, both structural and operational, is key to the technical feasibility of vertical phasing. Engineers have to provide the strength and connectivity in the original structure to support the vertical expansion. Architects have to lay out the floors so that the original building will have sufficient elevators, stairways, and utilities to meet the needs of the larger structure and greater use. Less obviously perhaps, but as importantly, the owners, and building managers need to think through how the building will function during and after the vertical expansion. The managers of the HCSC building particularly stressed the point that the constructability of the project was only half the battle. The vertical expansion can only proceed if the original building can keep functioning during the years of construction for the vertical expansion.

The case studies demonstrate the practicality of vertical expansion. Each of the projects being built reported being on time and budget. None of them appeared to have suffered any major surprises and delays. In fact they each seemed to be proceeding

as fast as projects built on open lots – two years for Bentall Five and the Tufts Dental School, three years for the 24 story extension to the HCSC headquarters.

4. Planning issues

One significant uncertainty in planning a vertically phased building is whether current zoning and permitting laws and building codes will still be in place at the time a subsequent phase is built. The risk of some regulatory change increases with the time between phases, and probably cannot be eliminated entirely. Myriads of zoning, permitting, building code, and other laws at various governmental levels regulate the entitlement of projects, and it would be very difficult, if not impossible, to be able to lock in all such regulations at their current standard in perpetuity. However, the individuals involved in each of the four projects did secure enough of an adequate guarantee that the future phases could be built to give them sufficient comfort to move forward.

Each of the four projects profiled were able to lock in the zoning that applied to the site at the time of original construction to ensure that the vertical expansion could take place at the desired mass and height if and when the decision to move forward was made. All of the buildings were able to do so through various mechanisms with the local municipality. HCSC received a letter signed by the commissioner of the Chicago Department of Planning and Development ensuring that they would be able to expand vertically the building at any point in the future. Tufts was approved by the Boston Redevelopment Authority to build a 15 story building when the plans for the building were originally submitted. Citigroup received guaranteed development rights in perpetuity by making subway improvements to a subway stop located adjacent to the site. Bentall Capital was able to receive permitting that allowed for the building to be constructed in one or two phases.

In addition to zoning and permitting issues, possible changes in building codes have to be considered when planning a vertically phased building. Even if a local municipality has guaranteed the right to vertically phase a building, numerous changes in building, and other codes from other government entities can take place over time that may make it difficult to proceed as originally planned. Several of the project teams had to deal with actual or possible changes in code that mandated changes in the project plan, such as additional reinforcements, reduced building height, restrictions on work hours, or simply building to future known code standards, but these details did not prevent the project teams from moving forward.

5. Value

The discussions and evidence associated with the case studies showed that the valuation of the option associated with the flexibility to phase a project vertically needs to be surprisingly subtle. In a nutshell, the value of this option should depend on who is doing it, and whether the option is seen as "call" on possible expansion (that is, the ability to take advantage of a profitable opportunity), or as a "put" (that is, the ability to exit from a bad situation, such as through insurance) on a possible down-sizing of a project if markets turn bad.

The subtlety required to evaluate the flexibility with vertical phasing is unexpected because it seems to run counter to two conventional economic concepts. These are (Wikipedia, 2008):

(1) The "law of one price," that is that "in an efficient market all identical goods must have only one price".

(2) The concept of the "put-call parity," that puts and calls are essentially equivalent to each other. In our context this would be that that the ability to expand a building vertically from a lower level is the converse of the ability to scale it back from a higher level.

In fact, as explained below, the several situations are in fact quite different, so that the apparent contradictions to established wisdom do not exist.

The first difference in conditions is between corporate developers, who think of the vertically expandable space primarily in terms of their corporate headquarters or campus, and commercial developers, who compete in a broad metropolitan or regional market.

The second difference is between whether the option is seen as a "put" that enables commercial developers to scale back a planned development based upon an aggressive market, or as a "call" on possible expansion if a slow market heats up. The second difference is due to the unspoken reality that these two circumstances reflect quite different market conditions, specifically about the perceived growth rates in demand – which of course, is a fundamental determinant of the value of an option. The following sections describe these situations in detail.

Corporate real estate

Corporate developers are interested in the real estate as a means to support institutional objectives. Real estate for them is not a product to be delivered to the market. It is the way they serve the larger needs of the organization. As respondents in the case studies at HCSC, Tufts University and Citicorp stressed to us, institutions find it is vital to co-locate their office space so that their staff can easily share common services, interact with each other, and relocate various departments as the organization evolves. Office space "off site" is at best a poor substitute for contiguous space.

For example, to the managers of the Tufts project, meeting their expansion needs with a separate facility elsewhere in downtown Boston was not a viable alternative, even if it could be obtained nearby. This is because separate space would require them either to duplicate laboratory facilities or plan an expensive and complex system of transfers of test samples. Moreover, separate spaces would require faculty, staff, and students to transfer frequently between buildings, thus disrupting schedules, wasting time and generally being dysfunctional. For Tufts, the alternative to vertical expansion was a completely new site elsewhere, if a suitable one could be found that would not so disrupt employee commuting patterns that they would lose considerable staff. As the HCSC managers pointed out, their choices in this regard were very limited: any site not convenient to the Chicago commuter rail lines would have forced them to recruit and train a large number of their staff. For Citicorp, it was likewise essential to be sited at a specific location, in their case on top of an "express" one-stop train service to mid-town New York.

For corporate developers therefore, space of equivalent quality located off-site is simply not equivalent to space that can be provided by vertical expansion. In a sense, space off-site, away from their campus, is a very different kind of product. From the perspective of corporate developers, the choice between vertical expansion, and space elsewhere involves much more than a comparison of the price of the space; it must include the cost of prospective organizational disruptions. In a nutshell, corporate developers have a "private value" or non-market value on top of market values.

This means that, for a corporate developer, the full value of the option to expand vertically cannot be fairly derived by direct comparisons with the price trends and

volatility of office space of comparable quality in the metropolitan market. Specifically, traditional options analysis will underestimate the value of the vertical expansion to the corporate developer – because it does not account for the institutional value of "being under the same roof." As Guma (2008) shows in his financial analysis of HCSC's option to add 24 stories to its 30 story building, the vertical expansion was not worthwhile from a strictly financial perspective that omits HCSC's "private value." If one assumes that office space otherwise on the local market provides the benchmark for valuing the extra space, then the option for vertical expansion was not worthwhile. However, the case of HCSC is far different from that of other potential occupants who would not be so constrained by location and the need to be under the same roof as the original HCSC offices.

Commercial real estate

The situation is very different for commercial developers providing space as a commodity to their regional market. For them, vertical expansion is just another way to satisfy general market demands for space. The valuation of the option to expand vertically can therefore be evaluated by comparison to the local market for such space.

The concept of the options analysis is then fairly straightforward:

- The price of the option is the up-front cost associated with the extra strength of the structure required to carry the vertical expansion, plus the cost of the utility, and building infrastructure capacity required to service that addition (elevator shafts, service conduits, heating and cooling capacity, etc.), all designed and planned so as to avoid operational disruption or loss of functionality in the first (lower) phase while the second (upper) phase is built.
- The price for taking advantage of the option (technically known as the "strike price" for exercising the option) is the subsequent cost of building the vertical expansion.
- The value of the option then depends on the strike price, the volatility in the real estate market and the current price of existing real estate, as with the valuation of a classical "real" call option (e.g. as in McDonald and Siegel, 1986).

The quantification of the input parameters requires some effort, but the actual calculations are quite conventional given the above.

So described, the value of the option to expand vertically from a lower building to a higher building (a call on expansion) would seem to be necessarily equivalent to the value of the option to cut back on a planned higher building to the lower building (the put to reduce exposure). From the perspective of the design of the structure, the two situations are equivalent. However, logic and the evidence of the case studies indicates that there is a substantial difference between the alternative starting positions – either of a low building that could expand, or of a plan for a higher building that could be scaled back – and that these differences account for the difference in the value of the option to change the intended height of the building.

The difference in value of the options for flexibility in the height (the call for expansion or the put to reduce size) is due to quite different circumstances that lead to their consideration. In one case, the developers see a strong market and plan on a larger building but, just in case, they incorporate the put option of being able to build less initially. This was the situation for Bentall, who planned their project during the

dot.com boom, and who then exercised their option to build smaller after the bubble burst and after 9/11. In the other situation, the developers face a weaker market, plan on a lower building but, just in case, incorporate a call option to expand. Physically, the structure that permits the change in height can be the same in each case. From the perspective of the financial analysis however, the cases are strongly different because the inputs to the financial valuation – that is, the assessment of the market strength – are markedly different.

To be specific, the differences between the two situations stem from the different prices of the real estate at the time of planning and design, which lead to the different starting positions of a higher or lower building. The logic is that different market conditions – as reflected in the prices for the office space – lead both to different construction plans and to different values for the options.

Decisions on how much capacity to build depend mainly on three factors:

(1) The rate of growth in the demand, which indicates how long it will take before the capacity is filled.

(2) The cost of money, which defines the cost of carrying the unused capacity.

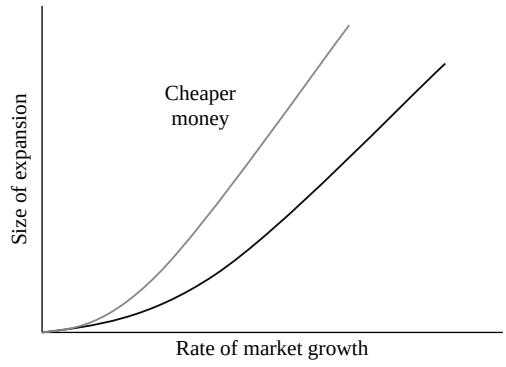
(3) The level of fixed and other costs that determine the economies of scale in implementing larger designs.

In general terms, it is profitable to build larger when growth is rapid, money is cheap, and there are substantial economies of scale. For a given set of fixed costs – lot size and design fees for example – the determinants of optimal size of expansion are the rapid rate of market growth and the cost of money, as Figure 1 indicates.

The rate of growth and the cost of money also determine the current price of the office space. Therefore, we have these situations:

- Higher market growth → higher market prices → decision to build larger and higher value of option.
- Lower market growth → lower market prices → decision to build lower and lower value of option.

To the extent that construction prices are the same, it follows from the above that the flexibility to change height is relatively more valuable when the markets are expansive.



Source: Adapted from Manne (1967)

Figure 1.
Higher growth rates and cheaper money lead to designs with greater capacity

In this context, it is interesting to note that the single major case we were able to discover of vertical phasing by a commercial developer concerns the Bentall development in which the developer chose to exercise the option to reduce the height of the project when the market turned down around during the 2001 recession.

Financial analysis

Guma (2008) investigated the financial aspects of the flexibility in the design of the HCSC building. He used an "engineering analysis" instead of a traditional financial analysis. A financial analysis simulates possible market conditions (as explicitly in a lattice analysis or implicitly in a Black-Scholes formulation) and produces a value for the option. This result is sufficient for traders. But it is not sufficient information for owners of a physical option. Decision makers who will hold the option indefinitely, such as the corporate owners of the HCSC building, need to know how the flexibility will affect their risk profile and value of the overall investment.

The "engineering analysis" not only simulates the evolution of uncertainties, but retains the results explicitly so that decision-makers can appreciate how an option for flexibility affects important decision criteria such as the average net present value (NPV), the minimum value (often a crucial consideration), and the return on investment (ROI). Operationally, the "engineering analysis" uses Monte Carlo simulation to calculate the financial outcomes that could result from possible future market conditions coupled with intelligent exercise of the option when conditions are sufficiently opportune (de Neufville and Scholtes, in press).

Coupling the "engineering analysis" with historic data on the Chicago market, Guma (2008) found that the option of flexible design increased the expected NPV of the HCSC project by about $10 million, compared to the alternative of the low building without the option. But the overall picture is much more complex and interesting. For example, erecting a taller building immediately could deliver a higher expected NPV, but would involve much more downside risk. Table I compares the alternative projects across several dimensions.

As often occurs, no design is a clear winner on all fronts. The smaller building is an acceptable project on the basis of the assumed hurdle rate of 10 percent. However, it does not deliver either the maximum NPV or highest ROI. Conversely, the larger building delivers about double the expected NPV, but at almost twice the initial investment, and is much riskier in terms of the possible loss.

The flexible design offers an interesting middle ground between these inflexible alternatives, and may thus be most attractive to many decision makers, as Table II

	Values in millions of dollars		
	Low building Phase I only	High building Phase I + II	Flexible building
Initial investment	213	393	238
Expected NPV	22	40	32
Maximum NPV	78	152	119
Minimum NPV (loss)	37	65	52
ROI (%)	10.4	10.2	13.3

Source: Guma (2008)

Table I.
Financial analysis for HCSC building

indicates. Compared to the low building, it increases the expected NPV by almost 50 percent for only about a 10 percent increase in initial investment. Conversely, compared to the high building, it cuts initial investment by about 40 percent, while only reducing expected NPV by about 20 percent. Overall, the flexible design reduces downside exposure (by starting off small), while increasing upside potential (by allowing for expansion when circumstances are favorable). Both factors are positive and lead to the result in this case that the flexible design provides the highest ROI.

6. Likely sponsors

The above discussion suggests when and for whom vertical flexibility in design is most valuable, and thus when this flexibility should most actively be pursued as a design option.

Vertical phasing seems most attractive to corporate real estate developers. Companies or institutions that need their space to be closely connected are those that can benefit most from designs that give them the option to expand vertically. The sample of case studies bear witness to this conclusion: three out of the four major cases of vertical phasing we were able to identify and study were sponsored by institutions building for their own use: Citicorp, HCSC, and Tufts University Dental School. For these developers, alternative possibilities of expansion in comparable quality space are at a disadvantage because they are off-site and could not provide comparable convenience. For this reason, vertical phasing may be especially attractive to major long-term organizations.

Commercial developers conversely will find vertical phasing relatively less attractive. For them, development of office space at different sites does not present particular difficulties. Indeed, the case studies offer few examples of vertical phasing of projects for commercial development.

Commercial developers may however find the option of vertical phasing most attractive during expansive markets when there is the tendency to build large. Under these circumstances, when a developer is planning to build a higher building, the cost of the option to phase back is relatively low since not much extra needs to be done, and the value of the option is relatively high if there is a major reset in the market for space. Planning for and designing the flexibility to cut the size of the project then appears worthwhile – as it did in Vancouver for the Bentall project.

Conversely, the vertical phasing would look relatively unattractive for developers planning on building a smaller building because market prices are low. From this starting point, they face the decision to spend considerably more on their project (to beef up the structure to carry eventual greater loads) while losing out on immediate revenues (due to loss of the floor plate due to extra space for elevator shafts) during a period when prices for space are comparatively low.

	Flexible building better than	
	Low building Phase I only	High building Phase I + II
Initial investment		Yes
Expected NPV	Yes	
Maximum NPV	Yes	
Minimum NPV		Yes
ROI	Yes	Yes

Table II. Advantage of flexible HCSC building compared to alternative

7. Conclusion

Vertical phasing of buildings is an interesting, workable option for developers of corporate real estate. Major examples exist and appear to offer fully satisfactory service to their owners. Based on the case studies, it appears that vertical phasing is more likely to make sense to corporate developers, who naturally place a premium – a private value in addition to the market value – on being under the same roof.

Vertical phasing of buildings may also be valuable to commercial developers, as a way of enabling them to adjust their offer to markets conditions as they reset over time. In this context, it may be that this option is most valuable as ability to scale back investments if there is a sudden downturn in the market.

These case studies are instructive but of course, cannot be definitive. The Center for Real Estate at the Massachusetts Institute of Technology will be continuing to investigate the possibilities of vertical phasing in the years ahead, and looks forward to comments, suggestions and collaborative inputs from industry experts.

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