

MANAGING REAL OPTIONS IN NOT-FOR-PROFIT ORGANIZATIONS: THE CASE OF SHELL SPACE

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ABSTRACT

The authors are a finance professor and an administrator in a major suburban independent school district who minored in finance while working toward his doctorate in education. We have used the case of shell space to discover the different incentives non-profit administrators have in the acquisition, recognition, and rational exercise of real options by their organizations (compared with managers of for-profit businesses). Shell space is space within a new building that has been enclosed against the elements, but not yet finished for its intended future use. The shell space can be viewed as a set of complex options (along the lines of the Stulz–Johnson options to choose among a group of several possible finished outcomes with different costs of exercise). A business executive could be expected to make the acquisition decision based on the value drivers known to impact such options. In the not-for-profit arena, though, decisions about the acquisition and use of options are driven by incentives that arise

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from within the organization or emanate from the politically elected (or appointed) board of trustees.

INTRODUCTION

Sarah Van Helfenstein (previous chapter) describes insightfully how we can better understand what is now being labeled “systemic risk” as just the result of rational exercise of the wide variety of real options that exist within economic systems.¹ There is a growing literature on the issues arising from managing real options within business organizations, but there has yet been little discussion of the often very different incentives for creating, capturing, nurturing, or exercising real options in the not-for-profit organizations that make up a large portion of the overall economic/political landscape. Increasingly, the focus is on optimal exercise of real options as the critical executive function, as opposed to accurate calculation of the options’ respective values.²

In this work, we explore the incentives for non-profit decision-makers at various stages of real options acquisition, recognition, and exercise, beginning with the case of shell space and then extending to other real options situations. These incentives give worthwhile insight into the rational exercise of real options within a major portion of our economic system, and hence improved insight into recent flares of systemic risk.

In their essence, options provide value by making it possible to participate in the opportunity represented by owning an asset in hopes of seeing its value increase, while keeping potential losses limited (the value of the option comes from the losses avoided by holding it). Hans Stoll (1969) demonstrates how a simple call option – which gives the holder the privilege, without the obligation, of buying the specified underlying asset at a specified price (called the exercise price or the strike price) within a specified period (the expiration) – can be replicated. A perfect replication of the call option can be created by purchasing the underlying asset, assisted by a loan taken against the promised payment of the exercise price on the expiration date, and protected by a put option that provides its holder the privilege (without the obligation) to sell the specified underlying asset at the same exercise price, within the same expiration limit. The holder of this package gains full participation in the potential for increasing value of the asset, with reduced investment due to the power of borrowing, and protection from losing money if the value of the asset falls below the exercise price (if necessary, the put could be exercised to sell the asset for the amount needed to settle the debt), and therefore, the loss

is limited to no more than the initial net investment. Therefore, having a call option is like buying the underlying asset with the help of financial leverage, while keeping the insurance provided by the put.

In developing the literature on the real options approach for capital investment decisions in business organizations, the underlying premise has been that when shareholders (and other investors) perceive the real options and learn details about them, they will include these option values in the process of evaluating the securities issued by the firm. Real options are thought to resemble financial options such as exchange-traded calls and puts, except that the underlying assets are real assets (as opposed to financial assets such as stocks) and that the rules governing exercise come from the real world rather than from a legal contract. Then, relationships that drive the value of financial options are extended to analyze decisions about acquiring and exercising real options, with decision-makers thought to be seeking maximum market value at each decision.

A decision-maker of a for-profit business would face strong difficulties in estimating the value added to the organization by having the real option and assessing the change in value if the option were exercised, but the focus would be on market value or a reasonable proxy of it. When real options are created or acquired by not-for-profit organizations, though, there is not a strong connection with evaluation processes in financial markets. A non-profit administrator would face measures of value that may be much less clear. In the case of a school administrator, the broad objective is to provide quality education within the bounds of acceptable cost. Quality is difficult to capture in quantitative measures, except perhaps through proxies such as student/teacher ratios, average class size, scores on standardized tests, graduation rates, or percentage of graduates who proceed to college. Cost may be reduced in the political mix to simplified proxies such as annual expenditures per pupil. The harried administrator may have incentives to focus on these admittedly imprecise measures of benefit versus cost. Also, administrators may be driven by more organization-specific incentives that we will now explore in the context of shell space.

It might charitably be asserted that school administrators, for example, want to achieve educational objectives in the most cost effective manner. Yet, as we will see upon examination of the incentives for decision-makers, the rationale for acquisition and exercise of real options can be quite different for decision-makers in not-for-profit organizations than those in for-profit business organizations. We will start with the case of shell space and then extend the analysis to other real options³ that are prevalent in the not-for-profit arena.

THE CASE OF SHELL SPACE

Shell space in new buildings refers to areas that have been fully enclosed from the environment with an exterior shell but left unfinished pending future commitment of resources to the completion. While in this fully enclosed but unfinished state, the shell space provides real options for which the underlying asset is finished interior space such as classrooms in a school or operating rooms in a hospital. The exercise price is the cost of completing the construction. There is no fixed expiration date for such real options, but the remaining useful life of the initial complex imposes limitations on how long it is possible to delay full completion (if not with the expensive finishing of, say, an operating room in a hospital; then at least with something less expensive but still useful, such as conference space).⁴

Shell space is less expensive than the alternative of finishing the space during the initial construction, but it can be significantly more expensive than simply preparing the new building for later expansion by strengthening the framework to allow for later addition of higher stories, or even framing out (but not enclosing) an upper story. Indeed, when such a steel framework, crowning another wing of the building, was clearly visible through the classroom window, one of the authors regularly used it as an example when explaining the concept of real options to finance students.

DECISION TO ACQUIRE SHELL SPACE

The cost of adding shell space seems at first to be a straightforward function of cost per square foot. Still, the whole picture deserves a closer look. Enclosing a space with roof and exterior walls involves opportunities for economies of scale (the area of enclosed space expands exponentially relative to additions upon the building's length, width, or height). Also, building cost per square foot may be lower for a large-scale project on a single site, compared with the same total space scattered over smaller scale projects on multiple sites (or on adjacent sites at different times). Therefore, total construction costs may be reduced (while still remaining within budget constraints for the initial period) by means of building a large enclosure with some shell space reserved for the future. Also, the aesthetics of the finished building may be enhanced by fully enclosing the desired exterior while holding down initial period costs by keeping some shell space in reserve.

Incentives for Those Making Decisions to Acquire Shell Space

For the decision-maker in a not-for-profit organization, shell space offers a way to maximize the total enclosed space that can be acquired within the confines of a limited budget for the initial period. Once the expansion option is in hand, it gives the school district superintendent or hospital administrator leverage with the politically elected (or appointed) board of trustees when the time comes to finish the space. Then, the argument might be that the original investment would be wasted without the authorization for further resources to finish the interior. Faced with a given initial limitation, therefore, the administrator has incentives to enclose shell space to gain more persuasion in future budget negotiations. Of course, this is counter to the purely business description of an option as conveying the privilege, but not the obligation, to exercise.

Unlike a decision-maker in a for-profit business, who seeks to acquire real options when the value of the option exceeds the cost of acquisition, the administrator of a not-for-profit organization has no incentive to focus on the value of the options acquired. Instead, this administrator has incentives to focus on maximizing the benefits to the organization that can be acquired within a given limitation upon expenditures in the initial time period (and any benefits to the organization are not reflected in market transactions).

Choosing the location of the shell space within the building may also be different in a not-for-profit organization. To gain the greatest leverage for future funding, a school or hospital administrator has incentives to pick visible locations for the shell space – thus increasing the public relations impact of the constant visible reminder that future funding is needed. With a for-profit business, the incentives are more in line with keeping the shell space strategically located, or even discretely out-of-sight (so as not to call attention from competitors).

DECISIONS TO EXERCISE SHELL SPACE REAL OPTIONS

The options involved in shell space are complex. Besides having loosely defined expiration and variable exercise prices, there may be multiple alternative uses for a given space that involve different finishing costs. In a hospital, for example, a given space might be finished for use as an operating suite (with high finishing cost due to the specialized plumbing and wiring

requirements), or alternatively into a space for medical imaging equipment, or a conference space (with much lower finishing costs than other alternatives). In a school, the space might be used for classrooms, administration, cafeteria, or sports facilities – all with different finishing costs. Furthermore, any decision to exercise the option cancels the possibility of exercising in another way at a future time when more information has become available.

Luehrman's Intuition about When to Exercise Real Options

The challenge of making the best choices when exercising real options has become a central issue in the real options literature. Tim Luehrman (1998) offers an intuitive guide to optimal exercise of real options through his now classic “tomato garden” analogy (see Fig. 1). Panel A shows the direction of increasing value for the option. As we move from left to right along the horizontal “value-to-cost” scale, we follow a continuum starting at low value of the underlying asset relative to the cost of exercise (where the option is “out of the money” and would not be exercised). Moving to the right along the continuum, we pass the point where the value of the asset equals the exercise price (value-to-cost ratio is 1.0) and then move into the territory where the option might be profitably exercised (here the option is “in the money”).

As we move from top to bottom along the vertical “volatility” scale, we start where there is low potential for the value of the asset to change very much during the time remaining. Moving down, we follow a continuum toward ever more and more potential for the value of the asset to move (either up or down). Given the limitation on liability that is inherent in options, increased potential for movement translates into higher value for the option (because of full participation in upward moves, with limited exposure to downward moves). The dashed line moving diagonally from upper left toward lower right represents the combined effect of the twin vectors.

Luehrman divides this option space into six regions to develop the intuition about deciding when to exercise. He asks the reader to think of a gardener cultivating tomatoes and deciding when to pick them (i.e., when to exercise the real option). The gardener’s competition is a flock of birds that appear unannounced from time to time and would love to eat the tomatoes before the gardener picks them.

Region 1 in the option space (high on the value-to-cost scale and low on the volatility scale) contains options that are ready to exercise. Exercising

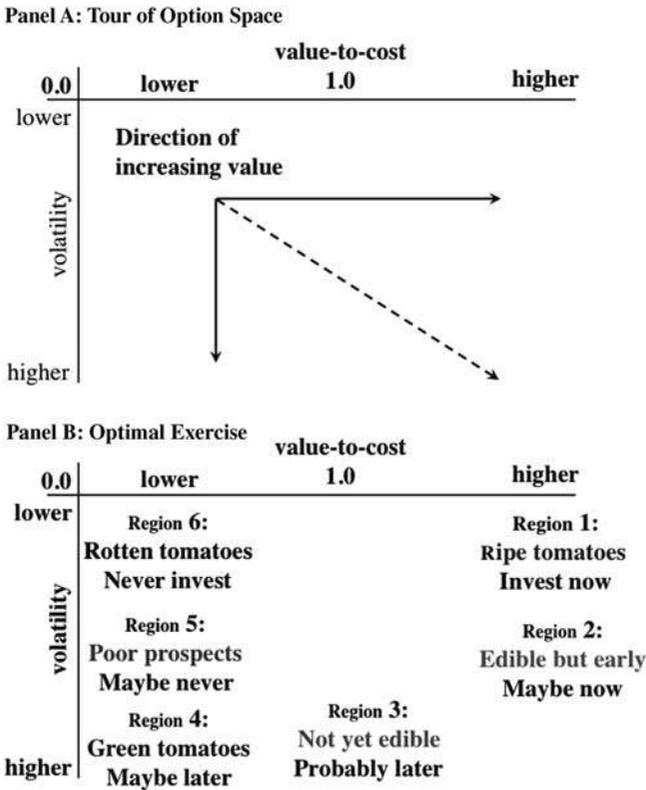


Fig. 1. When to Exercise? Source: Luehrman (1998).

the option is profitable now, and there is low likelihood of further movement in the underlying asset’s value. Indeed, the greatest concern here is the possibility that the competition might arrive (in the tomato garden analogy, the fruit is ripe and should be harvested before the birds get it).

Region 2 generates the most difficulty for the decision-maker. The crop is ready to harvest, yet still has potential to improve with a bit more time on the vine. In this situation, the greatest concern would be to gather information about the competitors. If they are nearby and active, it would be advisable to harvest. If there are no signs of activity among the competitors, it might be worthwhile to let the fruit continue to improve before harvesting.

In region 3, the options are “near the money” and so offer little or no profit if exercised. There is still high potential for improvement in value, and therefore, unless there are immediate threats from the competition, the fruit

should be left to ripen on the vine. Only if the competitors present an imminent threat would it be advisable to harvest early and hope the fruit would ripen satisfactorily on a sunny windowsill.

In region 4, the difficulty for the decision-maker has become much reduced. The options are “out-of-the-money” with substantial potential for improvement if the fruit were left on the vine to ripen. Therefore, the advice would normally be to delay the harvest.

In region 5, we have “out-of-the-money” options with smaller likelihood of improvement. Now would not be a good time to harvest, and this assessment would probably not change. Finally, in region 6, we have “out-of-the-money” options with no potential for the value of the underlying asset to improve. These we should write off and take our losses.

Options to Expand

When management decisions are subject to market discipline, the incentive is to maximize the combined value of the initial-phase facility plus the value of expansion options. The primary variables that drive the value of expansion options are time remaining until expiration and volatility of value for the underlying assets. More time and volatility translate into higher option values.

Perhaps the biggest difference in the way decisions are made about exercising options to expand existing finished space for non-profits lies in the strong disincentive to simply allow the option to expire without being exercised. With a for-profit business, options would normally only be exercised if the added value of the finished space exceeds the cost of exercise. For the non-profit administrator, though, letting the option expire (leaving the shell space unfinished) could make future funding initiatives more difficult. Thus as the building ages (so that finishing space within it seems less sensible), the incentive would be to choose one of the alternative uses that involves relatively low finishing cost and remove the inconvenient reminder of past decisions (even if the added value of the finished space might not be judged sufficient to offset the cost, if the matter were subject to market discipline). Thus a non-profit administrator might be tempted to exercise options that lie within region 5 (or even region 6) of Fig. 1.

When benefits to the organization are not reflected in market transactions, moreover, any decisions about exercising shell space options may be driven in very different ways than would be the case in a business organization. Rather than seeking the opportune time for value maximization, plus the optimal use that offers the largest difference between finishing costs and market value

added, non-profit administrators seek to maximize internal organizational benefits. For a purely business decision, choosing the opportune time for exercise would involve consideration of the option value lost by committing to a particular use for the space, when substantial uncertainty remains concerning the value of alternative uses relative to their associated costs, and sufficient time remains to await further information. Administrators of non-profit organizations, though, have incentives to get the shell space finished as soon as funding becomes available. It makes them appear more effective than would be the case if they waited for more information even though funding were available immediately. Therefore, options that lie within region 3 of Fig. 1, or even region 4, might be exercised immediately.

Moreover, the most valuable use of the space, in the eyes of a non-profit administrator, could be the use that makes the others within the organization most happy, yet still pleases the politically chosen board of trustees. For a school administrator, classroom space in hand today could trump office space or sport facilities, because new classroom space makes teachers happy and helps public relations. For a hospital administrator, more operating room space in hand might trump laboratory space or space for high-technology medical imaging systems that may be very useful but offer less benefit for staff physicians or lower public relations impact.

Options to Defer

It may be that at the time of initial construction, the decision-maker has difficulty anticipating the exact nature of the organization's future needs. Then, shell space offers the opportunity to gain the benefits of scale economies during the initial construction, thus maximizing the space than can be enclosed with the funding available in the initial period. With options to defer, the variables with greatest impact on option value are time and volatility (more of either translates into higher value). For a business organization, the delay would provide the added value of being able to await future arrival of information needed to clarify the best use of the space.

When the organization does not face market discipline, there is not an incentive to maximize market value added from a decision. For a non-profit organization, therefore, the array of goals would be (1) maximize the funding that is available immediately through the political process and (2) use the leverage to gain additional funding as soon as possible thereafter. Awaiting future resolution of uncertainty would be a lesser consideration for a non-profit administrator than for a business executive.

FURTHER BENEFITS OF SHELL SPACE AND INCENTIVES INVOLVED WITH OTHER REAL OPTIONS

Earlier Completion of Future Projects

For school or hospital administrators (and other non-profits as well), new funding must wait for existing capacity to be exhausted, or for there to be a widespread perception that it soon will be. Then the time required to start new construction and complete the work leads to an extended period of excess demand for limited available capacity (schools must resort to temporary portable buildings and hospitals must delay procedures or send patients to alternative locations, resulting in foregone revenues).

Having shell space ready in advance of the capacity pressures makes it possible to respond more quickly and restore the organization to normal proficiency. This is a kind of switching option (an option that allows switching from one state to another). For a non-profit administrator, the incentives for possessing such options are focused on reduced administrative sacrifices required to stabilize an unbalanced situation (so, less disruption).

Less Disruption

When capacity shortfalls loom immediately, one common approach to remediation is to shuffle several departments into compressed space to accommodate a function that has been dislocated by the onset of new construction. If shell space had been created in advance, however, some of it might be placed in temporary use while other shell space undergoes finish work. This is a kind of flexibility option.⁵ Again, for a non-profit administrator, the incentives for possessing such options are focused on reduced administrative sacrifices required to stabilize an unbalanced situation.

Better Facility Layout

By planning ahead, placing shell space strategically so that adjacent existing functions can be expanded into it, long-term functional relationships can be established (such as classrooms clustered around cafeteria space in schools, or operating suites near necessary laboratory facilities in hospitals). This is another sort of flexibility option, for which the above incentives apply.

Temporary Use of Shell Space

Shell space might be sealed until future development, or it could be placed in temporary use as storage space, or even (with climate control equipment enabled) as conference space. In a school, shell space originally designated for cafeteria or auditorium use might even be partitioned into temporary classroom space as an alternative to portable buildings. Again, this is another sort of flexibility option for which the above incentives again apply.

Enhanced Objectivity for Future Decisions about Space Utilization

When functional departments feel that their future needs are well represented in resource allocation negotiations, their representatives might be more candid. If they doubt that their needs are fairly assessed, they may provide biased inputs into the resource allocation process. Effective deployment of shell space by non-profit administrators may therefore result in more candid inputs into future resource allocation negotiations. This would offer greater value the more uncertainty there is about future needs.

EXTENSION TO OTHER REAL OPTIONS THAT OCCUR AMONG NOT-FOR-PROFIT ORGANIZATIONS

School districts allocate money for everything from capital expenditures, such as new schools, additions to existing schools and other facilities, to the purchase of textbooks and maintenance supplies. Expenditures occur at both the district and the building levels. Here also, administrators try to make cost-effective financial decisions and still achieve desired educational objectives. In these decisions, other real options can be found.

Portable Buildings versus Permanent Structures

School administrators often must wait until existing facilities are utilized at full capacity (or forecast to soon reach capacity) before they can seek funding for new facilities. This calls for short-term measures to deal with the facility shortages, because average time for completion of new school

construction is three years.⁶ Often, the solution is to acquire portable buildings. These portable buildings convey real options, because when they are no longer needed in one place they can be moved to other locations, mothballed for later use, or sold to other districts. The real options reduce the risk of acquiring portable buildings; and in a business environment, these options would be analyzed as abandonment options. For a business, such options would be acquired if their impact on market value, net of cost, were positive. For a non-profit organization, the rationale for acquisition would focus on reduction of stress on the organization during the time needed for constructing permanent facilities.

For a business organization, exercising the abandonment option would be triggered when the value of the underlying asset exceeds the cost of exercise. Please remember here that the cost of exercise includes the value foregone when an option is extinguished before it has finally expired.

For non-profit organizations, though, market value is not a pressing issue. The non-profit administrator might be more concerned about the appearance of wasting resources if the portable units were mothballed and stored. Likewise, the non-profit administrator might be more concerned about the appearance of failure (or desperation) if portable units were sold – before the end of their useful lives – to another district. The portable units would then continue to be deployed within the system, even if not fully utilized. Therefore, non-profit administrators have disincentives against exercising abandonment options. Such options may be allowed to languish until they finally expire unused.

One way to ease the stress on school administrators while at the same time returning many of the future decisions to the market value arena would be for the school system to lease the temporary units from a business enterprise. The added value of such arrangements could be shared with the school system through lease rates that are more attractive than the alternative of buying.

Land for Future Development

Acquiring land in a key location offers the opportunity, at some time in the future, of exchanging the vacant space for any of several alternative uses (with no set expiration date by which the choice must be consummated). Such options are similar to the options analyzed by [Rene Stulz \(1982\)](#) and [Herb Johnson \(1987\)](#).⁷ One thing that can clearly be said about the value-drivers for such options is that the options are more valuable the lower the

correlation among the values of the different underlying assets (i.e., the alternative uses). As exercising the options extinguishes any remaining value generated by the possibility for choosing an alternative use in the future, there would be an incentive in the for-profit environment to wait for resolution of uncertainty about which of the alternative uses might finally emerge as the most valuable.

In a school system (or other non-profit environment), the pressure is toward early exercise, to avoid the appearance of indecision or the perception that the original acquisition was hasty or even wasteful. The land would likely be used for the first alternative that becomes ripe for development (i.e., in terms of Fig. 1, options that are in regions 3, 4, or even 5 might be exercised immediately). When there is no reference to the impact of management decisions on any market estimation of the value of the organization, option values often will not be maximized.

Contraction of Services

Now let us turn to an option to reduce or eliminate service or capacity. In this particular scenario, a portion of a school system is operating significantly below the capacity available from its facilities, with a low ratio of students to teachers (with personnel costs being the primary driver of costs for the school system, having fewer students per teacher adds substantially to the cost per pupil). Furthermore, enrollment in this sector is expected to continue shrinking. As the administrators consider this scenario, they realize that there is an option to reduce service/production (an option to shrink is a less extreme version of an abandonment option).

In the case of a for-profit business, the focus for decisions would be on taking the actions that maximize market value of the organization. For the administrators of a non-profit organization, however, the focus would be on reducing the stresses within the organization. Rather than cleanly reducing staff through termination or layoffs, the incentives for the administrators would be to allow gradual staff reduction by attrition, with gradual reassignment of remaining staff. Rather than closing facilities and selling unused resources, the incentives would be toward slower expansion in growing areas, with redistricting to divert students from other areas into the facilities that are experiencing declining enrollments. While such moves would give wide distribution to low levels of stress, administrators would avoid high levels of stress within concentrated areas. From a value-based perspective, though, the actions could be value diminishing.

Too Big to Fail

State governments (and even the federal government) sometime provide put options to large urban school systems that are considered too big (or too politically important) to be allowed to fail. Therefore, when such school systems extend themselves to the point of potential insolvency, they can rely on the prospect of a bailout from higher levels of government. The existence of such put options is well known to create “moral hazard” incentives for taking ill-advised risks.

Whereas in the previous examples, we have seen multiple instances of early extinguishment of options when further risk is well advised from the perspective of market value maximization, here we encounter the prospect of non-profit organizations potentially incurring risks that are ill advised from a market value perspective, because of the put options that are given to them from higher levels of government. Here, there is a large element of what has been called systemic risk.

CONCLUDING REMARKS

The real options approach allows decision-makers to more accurately picture what a given expenditure decision may entail. Plus, real options allow for management intervention at varying points throughout the project’s life. We have used the case of shell space to discover the different incentives non-profit administrators have in the acquisition, recognition, and rational exercise of real options by their organizations (compared with managers of for-profit businesses). While business executives can be expected to base such decisions on the anticipated impact on market value of the securities issued by the firm, non-profit administrators have no connection to a securities market valuation process. In the not-for-profit arena, decisions about the acquisition and use of options are driven by incentives that arise from within the organization or emanate from the politically elected (or appointed) board of trustees.

Shell space is space within a new building that has been enclosed against the elements, but not yet finished for its intended future use. Often, it is isolated from the climate control systems of the building. The shell space can be viewed as a set of complex options (along the lines of the Stulz–Johnson options to choose among a group of several possible finished outcomes with different costs of exercise). A business executive could be expected to make

the acquisition decision based on the estimated values of the expansion options and deferral options the shell space represents. In turn, the exercise decision could be expected to reflect the impact on the combined value of the existing facility and the remaining options, thus considering the potential loss of value from the remaining options that are extinguished upon exercise. Also, a business decision-maker would not flinch at allowing the options to expire unused, if the added value from exercise does not offset the cost of finishing.

When deciding whether to acquire shell space as part of the initial phase of construction, non-profit administrators are concerned about gaining the most organizational value from the initial funding. The economies of scale in construction allow a larger space to be enclosed with the funds available initially, if some of the spaced is shelled in reserve for future expansion. Administrators would stringently avoid the prospect of the options being allowed to expire unused, because of the appearance of waste. The incentives would be to exercise the options at the earliest opportunity, and perhaps even base the choice among the alternative uses, at least in part, upon the amount of available funding. In short, the incentives are to use the creation of shell space as a means of maximizing the space for the organization that can be gained from the initial funding and then use the unfinished space as leverage to gain more funding in the future.

In sum, non-profit administrators have incentives that lead them sometimes to acquire expansion options at higher prices than would for-profit executives. Non-profit administrators also have incentives that lead them to exercise expansion options sooner, while exercising abandonment options later (or not at all).

Furthermore, large urban school districts may be on the receiving end of put options provided by state (or even federal) levels of government because these districts are considered too big (or too politically important) to be allowed to fail. Such districts can rely on the prospects of a bailout. These put options create perverse incentives for taking ill-advised risks.

We have seen several examples, therefore, of situations in which non-profit administrators have incentives to extinguish expansion options early, when further risk is well advised from the perspective of market value maximization. Then, we have encountered the prospect of non-profit organizations that are “too big to fail” potentially incurring risks that are ill advised from a market value perspective.

NOTES

1. See also Van Helpenstein (2008).
2. See Majd and Pindyck (1987) for an early discussion of the decision about when to exercise real options.
3. For a thorough listing of the variety of real options, see Trigeorgis (1995, 1996) and Trigeorgis and Mason (1987).
4. For an excellent discussion of shell space in new hospital construction, see Roark, Brooks, and Kilgore (1993).
5. See Trigeorgis and Mason (1987) or Triantis and Hodder (1990) for further discussion of managerial flexibility.
6. See the 2008 *Annual School Construction Report*, a supplement to *School Planning and Management*, February 2008 (CR1-CR16).
7. Estimation of values for such options requires an iterative computer procedure implemented by the algorithm created by Mark Schervish (1985), or the algorithm created by Boyle and Tse (1990).

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