TOOLS FOR THE STRATEGIC DESIGN OF BUILDINGS

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Introduction:

As the post-industrial, post-modern society is firmly taking hold, the issues of "quality" and "excellence" are rapidly replacing the production related considerations, such as mass production, product optimization, maximization of single objective functions, and so on, as the dominant concerns of the day. In literature these changes have been seen as major shifts, as they lead to a redefinition of the domain's valuational system and a realignment of its goals. At the operational level, one consequence of this change in almost every field of endeavour is that the traditional norms governing the delivery of goods and services are also critically reviewed, changed or realigned. (Bell,1976; Daley and Cobb, 11989; Kung, 1990)

The architectural domain is also experiencing a similar shift in its long standing paradigms. Its governing valuational system is shifting dramatically from a quantitative, industrial/production centred world view to a qualitative one. In practical terms, this change signifies nothing less than the abandoning of the traditional production/design axis in favour of seeking architectural excellence without any production related constraints.(Jencks,1981,1987; Portoghesi,1983) Indeed, it has been argued that it is a move away from the "product" as the basis of domain's valuational enterprise, and towards the client/user/ community as the locus of its concerns (Mohsini,1989,1992).

In spite of all these changes, however, architectural education and practice are still dominated by the vestiges of the modernist/industrial heritage. Of these, the conceptual foundations of building process are of greatest importance, as these have traditionally formed the cerebral and spinal connections between the various clusters of activities undertaken to deliver a building project. How the building process is organized and managed, is contingent not only upon the physical requirements of the project, but also on the valuational dimensions of the prevailing paradigm. At the present time, the building process, both in terms of its intellectual as well as operational underpinnings, is firmly rooted in the modernist/industrial world views. Given the shifts in the valuational orientation of the domain, however, it is an increasingly anomalous condition which raises the question about the traditional building process' continued viability as the vehicle for the development and delivery of architectural ideas and products .

In this paper we investigate this particular anomaly and seek to establish the extent to which the traditional building process has been affected with the emerging paradigm shifts, and what impact this change is having upon the domain's decision making tools and technology.

One may recall Sir Nicholas Pevsner's famous quip that a "bicycle shed is a building but Lincoln Cathedral is a piece of architecture" (Pevsner,1957) for two important reasons:

1) as a polemic statement, representing the traditional view of the architectural domain and its internal dynamics, it explicitly establishes a linkage between " architecture" and "excellence," and

2) as an implicit reference to the traditional position of architects as the catalysts in delivering architectural excellence.

Both of these notions have formed the locus of architectural pedagogy, practice, and lore for a considerable period of time. (Saint, 1983) Architects, with their artistic/scientific background and "professional connoisseurship" have always been regarded as the "purveyors of Architecture." [Collins, 1971] The role, amply celebrated and supported in the disciplinary literature, professional/ institutional guidelines (RIBA, AIA), and the popular press(Ayn Rand), however, is firmly imbedded in the traditional practice of procuring building projects. It is predicated by the building client approaching an architect to initiate a building design process as soon as he perceives a need to acquire a building. The architect then establishes what is needed, designs a building based on the programmatic guidelines, and later supervises the production of the building by the contractors to assure the quality as stipulated in the design documents. Numerous models of this architect centred process, ranging from the highly mechanistic schema such as outlined in the AIA forms of contract [AIA,1963] or the RIBA plan of works [RIBA,1969],to incrementally progressive ones, where the process is defined in reaction and response to the parameters that emerge during the design process [Akin 1978, Rittel and Weber 1984, Schoen 1983], have been articulated. Central to all of these schemes, and quite consistent with Pevsner's position, are two important and invariable assumptions:

1) that the "design decisions" are the strategic decisions in the building process, and

2) that the architect is in charge of formulating these"strategic decisions."

It is important to note that this recurring synonymy between design and strategic decisions is not due to some conceptual misunderstanding of the building procurement process. Literature on building process has always been quite clear about the separation between the two. Collins [1971], for example, clearly makes the distinction between the "architectural environment" and the "architectural design," and Schoen places a strategic decision making phase ahead of the design phase when he suggests that "in order to formulate a design problem to be solved, the designer must frame a problematic situation, set its boundaries, select particular things and relations for attention, and impose on the situation a coherence that guides subsequent moves" [Schoen, 1988,p182]. Yet, an explicit jurisdictional separation between the "architectural environment" and the "architectural design" was never considered to be important because the architects were responsible for both of these aspects. As Philip Bobrow, in his extraordinarily insightful article suggests, in an era where 'time' and 'cost' ranked low on the scale of cultural values of the traditional patrons of architecture, the concerns of quality and excellence of

design indeed formed the strategic decision making domain.[Bobrow,1974]

Lately, however, most architectural work is initiated by a very different kind of building client. As Bobrow points out, "The Patron is dead, and his replacement has resulted in a major shift in values and objectives. The sponsor is here, and the old structures of the client/architect/contractor are no longer effective in either serving the sponsor or the public at large." The essence of this change, according to Gutman (1988), lies in the non-traditional value structure of the emerging organizational/ sponsor class of clients. He suggests that "the most significant characteristic of these organizational clients is their disposition to view facilities from a purely rational and instrumental perspective. This means that the organizational clients regard buildings as capital assets, which should be managed like every other potential source of productivity, income, and profit. As a result, plans for new buildings are judged in terms of their initial and maintenance costs, their resale value, their implications for corporate income, their usability as working environments, and their possible effect on organizational efficiency and employee morale. All features of the building come to be judged by these criteria, including the aesthetic dimension, which traditionally was considered as outside the realm of this system."(Gutman, 1988)

Consistent with this changed value structure, projects are now also initiated differently. To begin with, a fundamental shift in the locus of strategic decision-making has taken place. In an increasingly large number of building projects, a pre-design phase is emerging that is very different than the traditional project definition phase as articulated in AIA and RIBA documents. The traditional project definition phase was primarily predicated by a strategic decision that the building is to be procured using the design-bid-build process. Accordingly, dominated by the architects, it was instrumental in developing briefs and programs for the building project which laid down the strategic parameters for the project. Recent building project case studies indicate that a new kind of pre-design phase is evolving that is solely geared towards developing economic, technical, organizational and management parameters within which the building program and design are to take shape.(Mohsini,1987-93; NEDO,1983) It is no longer predicated by any building procurement strategy, and one of its most significant aspect is that even though it often accounts for as much as 30% of the project delivery time, and acts as an incubator for the strategic decisions, it is also marked by an almost complete absence of architects as active players.

The two case studies, presented at the end of this chapter as Exhibits A and B, clearly show this change. The first case study (Exhibit A) documents a project consisting of an extension of a major museum, while the second (Exhibit B) documents the design and construction of an incubator facility attached to a university. Both projects were designed and built using the traditional design-bid-build process, but the two had very different front-end processes. For the museum project, undertaken in the late 70's, the architects were retained at the very beginning of the project and were instrumental in developing all strategic parameters that influenced the design and the delivery of the project in the very traditional way. The incubator project, undertaken towards the end of the 80's, on the other hand, is marked by a non-traditional front-end phase. Here, a number of exploratory studies undertaken by a number of independet specialist organizations were instrumental in developing various design/development parameters. Only after these strategic parameters were established, the design architects were brought

in the building procurement process to design the facility within these limits.

Numerous other case studies of large and small projects indicate the same trend, namely, that design decisions are rapidly becoming subordinated to the higher level strategic concerns emanating from the current value structure of the building clients. Furthermore, there is also overwhelming evidence that the architects are decreasingly involved with the formulation of these strategic parameters, an ominous trend running counter to the traditional, architect centred, assumptions for achieving architectural excellence. (Mohsini,1987-93)

It is important to note that while this change at the front-end of the project procurement process seems to be quite compatible with the changes in the operating value system of the present day building clients, it is also raising questions concerning the quality of architecture thus procured. The same building process case studies also indicate that while the reorganization of the front-end process has certainly led to a greater owner satisfaction in terms of partial attributes, such as time and cost controls, incorporation of technology, fulfilment of functional requirements and so on, these undeniable achievements' however, are often gained at the expense of architectural excellence.

These later concerns of excellence indeed substantiate a near axiomatic derivative of the Pevsnor's dictum (which incidently can just as well be derived from the writings of other theorists such as Collins and Schoen), that excellence emanates directly from the strategic decisions. Traditionally it has meant that as long as the architects are able to influence the strategic decisions in the building process, the architectural excellence is attainable, even if not always achieved. The current changes in the building procurement process are shutting-out the architects from participating in the development of strategic parameters, but they have not changed the basic axiom. On the other hand, architects' exclusion from the front-end should not be seen as some diabolical conspricy but rather a function of their unpreparedness to deal with a new set of values, a new language of discourse, and a new set of algorithms that are rapidly replacing the old rules of the game. The danger, of course, is that unless the architects are rapidly brought up-to-date in the functioning of this evolving change, they will simply be swept away, even if at the detriment of total quality and excellence of the built environment.

To upgrade you need tools and technology. To bring some one back into strategic decision making domain, you need to equipp that someone with strategic decision making tools and technology. To establish what those right tools and technologies are and whether the exists ore need to be developed, let us begin by taking a systematic look at the new building procurement process that is replacing the traditional one.

The New Building Procurement Process

The term building procurement generally refers to a sequence of decisions and/or actions which lead to the acquisition of new buildings or space within buildings, either by directly buying, renting or leasing from the open market, or by designing and building the facility to meet a specific need.(Glover,1974) This definition is graphically developed in Figure 1.

The building procurement process is activated as soon as a facility related problem is seen to have a "building" solution (i.e. if the problem's solution lies in further acquisition of built space). The procurement process to deal with such a situation consists of a layered sequence of five distinct phases:

1) The problem definition phase
2) Solution iteration phase
3) Delivery process design/selection phase
4) Delivery team selection phase
5) Project delivery phase, which in turn, consists of,
    a) design
    b) design development
    c) construction
    d) close-out

In each of these phases some specific tasks are undertaken that allow the building client to make procurement related decisions. Thus, for example, in the first phase project related needs and client's objectives and constraints are analyzed and synthesized into information that allows the client to make the first strategic decision, namely whether to procure the building following the "off-the-shelf" procurement process, or to "design and build" it.

Proceeding through the diagram, one sees that this first strategic decision opens up two different procurement paths. Thus, if the building is to be acquired "off-the-shelf", i.e. the way, for example, a pre-engineered building or a mobile home is purchased, leased or rented, the procurement process involved is relatively simple. It consists of two steps:

1. the strategic task of setting up a selection criteria and,

2. the tactical task of scanning the market for the required product.

This type of procurement process can be completely handled by a procurement team consisting of the client and/or his agent.

A more complex procurement process is involved when the client decides to acquire the needed facility by having it designed and built. Regardless of whether he wants to rehabilitate an existing building or opts for the new construction, the procurement process now consists of four steps or phase:

1. The project goes through a feasibility assessment phase. Identified as Phase 2 in the diagram (Figure 1), here, using an iteration process, strategic parameters for the project are developed. Thus, for example, in case of a rehabilitation project,one would begin by identifying a suitable facility and then subjecting it ta host of functional, technical and economic viability studies to assess its suitability for the purpose and constraints defined in the first phase. A similar process would get under way if new construction is to be undertaken. Issues of site, extent of innovation and numerous preliminary ideas concerning the scope of the project

would be assessed in terms of their viabilities. The highly iterative processes used at this phase are thus instrumental in generating strategic parameters that guide the later delivery of the facility.

2. The next phase of the procurement process is concerned with the selection or design of a building delivery process. While traditionally there was really only one delivery process by which buildings were designed and built, the design-bid-build process, today a large number of generic delivery processes are available to a building client. These alternate ways to deliver buildings have evolved as the traditional building process became increasingly inadequate to deal with the rapid changes taking place in the building industry. (Glover,1974) The alternate building processes, however, come with their own advantages and limitations. As they are often designed to rectify some specific shortcoming of the traditional delivery process, each one of them is most effective only when certain conditions prevail. This, in turn, makes their selection or design to fit the project conditions, the third strategic task in the building procurement process.

3/4 The next two phases of the procurement process, dealing with the selection or assembly of the delivery team, and the production of the building through the routine phases of program development, design, design development, and construction, on the other hand, are purely tactical activities as they primarily deal with the implementation of strategies. For example, the selection or assembly of a delivery team can be routinely undertaken on a competence basis once an appropriate building delivery process is identified. Thus, if design-build process is deemed most suitable to procure a hospital extension, then all available design-build companies with experience in this type of work can be evaluated and the best one contracted. Similarly, the project delivery phase of such an hypothetical hospital extension project would also be fully predicated by the strategic parameters developed in the first three phases,as well as by the track record of the selected design-build delivery team.

Architects and the New Building Procurement Process

Where do architects fit-in in this increasingly complex building procurement process? Let us begin by looking at what architects can do best, and to what extent their skills are compatible with the emerging requirements of the building procurement process.

As Philip Bobrow points out provocatively, architects have never been entrusted with the mandate of the quality of the built environment, nor are they mandated with, in law, the aesthetic performance of the built environment. Traditionally, they have been licensed to protect the public, and this mandate has been narrowly interpreted as being responsible to the client, in law, for the technical performance of the building, and to the public at large for the safety and property damage consequences only. (Bobrow,1974)

The special training given to the architects, however, emphasizes and installs sensibilities that allow them to see the project in a more holistic manner than most of the other players in the building process. This special capability, to have a comprehensive

view of the situation, more than any other factor, sustained architects in the strategic decision making position in the traditional building process. It is this very same comprehensiveness that is again needed to integrate a very fragmented building procurement process.

The emerging building procurement process' emphasis on a vertical structure of sequential phases, is instrumental in bringing about two fundamental changes:

1) it takes away the strategic decision making from the task-organizations and places it with the owners and clients, i.e. with the organization set-up to oversee the interests of the project as a whole, and

2) it requires the maximization of project level goals and objectives instead of those of the sub-processes.

Cumulatively, these new conditions elevate the front-end phase of the building procurement process into both the specifier and the arbitrator of quality in the architectural domain. At the same time, however, the difficulty with this evolving restructuring is that to achieve its intended goals to the fullest measure, it requires the services of a new breed of professional facilitators who have a sufficiently comprehensive knowledge of the building process, who are able to help the owners and clients in developing the strategic parameters for the project, and who can also contribute those special sensibilities that lead to overall excellence.

Fortunately, many of the requirements of the front-end phase, especially those included in blocks 1&2 of Figure 1, are particularly compatible with the traditional skills of the architects. For example, the two levels of strategic activities, first dealing with the analysis and synthesis of needs and constraints of the client organization and the second concerned with the assessment of a multitude of tentative ideas through the standard architectural tools of sketches, concept design, and viability studies, have traditionally formed an important part of architectural training and practice. Furthermore, the holistic training of the architects, which allows them to recognize and integrate a vast array of issues with the overall integrity and quality of the project in mind, is particularly compatible with the emerging emphasis on the project level excellence and the ensuing demands of integrating the subprocesses within the higher level goals and objectives.

Yet, the mere compatibility of architects' traditional skills with some of the conceptual demands of the front-end building procurement process is not enough to claim the leadership position, or even entry, in this strategic phase. There are also many shortcomings that have caused the architects' increasing shut-out from this strategic decision-making phase.

To begin with, the architects' traditional skills are predicated by a single building procurement strategy - new construction - and a traditionally organized building process. The emerging front-end phase, however, requires not only the exploration of all traditional and non-traditional ways of solving the client's building related problems, but also the assessment of the feasibility of non-traditional building procurement processes (Figure 1, Block 3). Moreover, the language of the discourse, dictated primarily by the

mandate of the front-end process of developing the strategic guidelines for the project, and the accountability requirements imposed by the client organizations, is also different. For example, developing strategic design parameters in terms of costs and benefits, or designing the delivery process compatible with the clients' particular capabilities and constraints, are often alien to the traditional intuitive ways of architectural practice. More specifically, three distinct type of inquiries form the strategic core of the front-end phase. They are:

1. Problem definition and its in-depth articulation

While the traditional architectural patron was either clearly able to communicate what was needed or desired, or was unequivocally able to help the architects in developing the program for the building project, today's sponsors of building projects rarely operate in that consensual mode. More often than not, the sponsors come in form of committees and boards, where all or many diverging interests of the sponsor organization are represented. Each different interest brings with it a different need agenda that requires a specific programmatic resolution. Developing a consensus on what is really needed and how those needs can be best met in a building is the first strategic task confronting the front-end building process. Even in relatively simple situations, an understanding of theories of consensus building, intervention and conflict management, as well as application of support technologies such as multiattribute utility techniques and fuzzy logic are becoming requisite just to define the scope of the problem at hand.

2. Generation and viability assessment of multiple options

Architects are most adept at generating architectural solutions to problems that have been clearly identified. But what they almost never do is to consider other strategic options that are different than the design and building of a new facility. Neither do they perform comprehensive and aggregated viability studies to test whether, or to what extent, their proposals are able to solve the problems in terms of program, budget, financing, and schedule. Discussion of such issues, however, is the most crucial characteristic of the front-end process. If a sponsor can solve its stipulated problem, say, of lower productivity due to congested space in its office building, by simply reorganizing the layout of its existing facilities, then there is obviously no need to build a new facility. The solution must, however, be demonstrably solving the problem with the least amount of sacrifices associated with it. Similarly, a new building proposal must demonstrably fulfil all corporate goals and objectives with a minimum of sacrifice. What is of utmost importance here are the analytic and synthetical skills to achieve a balanced triangular relationship between the goals, the strategy, and the sacrifice.

3. Design of the project delivery process

The third important aspect of the front-end process is its concern with the assessment and design of the project delivery method. Until very recently there was only one project delivery approach by which buildings were designed and constructed. The traditional approach, dominated by the architects who initiated, and organized the building

process, was characterized by a design-bid-build sequence of operations, and by being well known to all members of the building industry and its clients. Today, however, a large number of alternative ways of delivering the project exist side by side. (Davidson, 1989; Glover,1974; Haviland,1976) These alternate project delivery options, which range from design-bid-build to design-build, and many others in between, differ not only in terms of differently sequencing the project delivery and thereby differently organizing the building process, but also in emphasizing and delivering different aspects of "excellence." Thus, for example, a client seeking a programmatic/ functional excellence as the prime objective and cost efficiency as the secondary goal, may be severely mismatched with a classical design-build delivery strategy which is usually geared towards delivering average programmatic performance at a highly cost effective level. Accordingly, consideration and assessment of existing delivery options, or designing new ways to meet the needs of the client is rapidly emerging as another non-traditional strategic decision making function.

The importance of these three inquiries in the incubation of projects becomes more obvious when one realizes that it is here that the foundations of architectural design are laid, and that influencing these phases is paramount if the agenda of architectural excellence is to be pursued. However, two important inhibitors are in way of bringing architects to play prominent role in this crucial phase of the building procurement process.

Firstly, as suggested earlier, the architects are still trained within the "world view" prescribed by the patron oriented traditional building process. This "design process" centred world view, a view that is becoming increasingly analogous to a pre Galilean conceptualization of earth centred universe, is not only misrepresenting the reality of the profession, but also adversely impacting on the agenda of "excellence" and "architecture." A designer incapable of influencing the strategic decision making in the building procurement process can not be expected to deliver excellence of any kind. Indeed, the sobering fact is that the traditional position of architects is rapidly being relegated to a tactical activity where a few good architects manage to do varying degrees of damage control, while most others are simply involved in the delivery of "buildings."

Secondly, a design process centred pedagogy is leading research and development efforts in the architectural domain, especially in the emerging areas such as the computer aided design, towards increasing sub-optimization of the design process. The design "tools" being developed, are tactical in nature. That is: they are primarily geared towards problem solving and optimization of the design process. They are, thus, not only irrelevant within the emerging client/user/community centred world view, where achievement of total quality and excellence is paramount, but also instrumental in further distancing the architects from the strategic decision making.

Conclusions: Strategic Decision Making Tools for Architects

A critical discourse, such as the preceding one, demands at its closure, that some recommendations to improve the situation be made. Let us begin this task by first recapitulating our problem. At the very centre of our concerns is the continued search for ways to achieve architectural excellence. The ideas concerning excellence, both in conceptual as well as in operational terms, however, are firmly imbedded in the

valuational system that governs a domain at a given point in time. And, as these valuational systems are almost always changing, the conceptual and operational articulations of excellence in that domain also adapt and change. Most of the time, these changes on both sides are subtle and take place gradually. Once in a while, dramatic and sweeping changes at a breathtaking pace occur. These paradigm shifts, in turn, demand fundamental realignment of both conceptual as well as operational foundations in the domain.

The post-industrial, post modern society is widely acknowledged to be such a paradigm shift from its industrial/modernist predecessor. In the architectural domain this paradigm shift is redefining both the conceptual foundations of excellence, and the organization of its procurement. Excellence is now beginning to be defined in terms of a multitude of non-traditional attributes centred around a complex client/user/community system, and it's success, accordingly, is now measured in terms of aggregate performance of all of the stipulated attributes, and not, as was the case earlier, in terms of single ones, such as design. Furthermore, the procurement of excellence is also differently organized. Not only are the strategic decision making functions aggregating at the front-end of the process, but also the front-end is emerging as the incubator for developing the most desirable combination between the goals of the client system, the strategic options that are available, and the associated sacrifices that the client system is willing to make. In other words, the front-end is emerging as the phase where the blue-prints for architectural excellence are developed.

Given this phenomenal aggregation of strategic decision making at the front-end, the traditional turf of the architects, we should have regarded these as exciting developments especially conducive to the achievement of architectural excellence. But numerous case studies of building projects indicate that the architectural profession is being shut out of this emerging front-end, and thereby is becoming an insignificant player in influencing architectural excellence. In the long run, this is an eminently unhealthy condition, both from the client/user/ community's point of view, as well as the profession's perspective. The architects must become part of this emerging strategic decision making phase. But the question is how?

While exploring the compatibilities of the architects with the demands of the emerging project procurement process, we identified two nested problems that are at the core of the present predicament: The traditional building process centred world view and the consequently evolved architectural educational system. The traditional building process, primarily due to historical reasons, is highly design process centred. Development of an architectural program, rather than a program designed to best resolve a client's building related needs, is at the heart of this process. For example, ***if the client needs a single family house, then the architects are fully qualified to establish her needs within that demand framework and design for her a an excellent single family house.*** On the other hand, ***if the client wishes to have an excellent shelter within her stipulated means and for her specific requirements, then the traditional architectural training does not prepare the architects to act in these circumstances.*** Most architects find themselves unprepared to deal with a problem setting situation where the triangular relationship between the goal-strategy-sacrifice is to be explored. The traditional architectural tools are similarly useless for such situations. For example, the programming

algorithms used by architects are specifically designed for solving architectural programming problems, i.e. they can help an architect develop a program as long as it is known what the project is is going to be (i.e., a single family house). Even the most modern tools, such as the computer aided design programs, are nothing more than aids at this tactical level. They may help architects generate infinite variations in plans and elevations, but they are still predicated by the problem being defined as unambiguously as a "single family house."

Today's clients, on the other hand, rarely see their building related needs as being well defined problems. Accordingly, they do not seek architectural programs at the very outset of the building procurement process. What they do seek, however, is a greater exploration and articulation of their perceived building related need, an extensive exploration of options, both in conceptual as well as operational terms, and an evaluation of those options in terms of what benefits and what sacrifices are associated with them. In the end an iteration of this kind of exploration, leads to the development of a strategic design consisting of a typological recommendation, a budgetary outline, a time-cost trade-off, a qualitative or quantitative specification for the sub-systems, etc.

Bringing the architectural profession in step with these developments affecting the domain is not an operationally difficult task, but it requires an overhaul of the prevalent world view concerning architectural excellence. From the operational point of view, the most effective intervention could be at the educational level. An introduction of a few comprehensive studios geared toward the front-end process, can be achieved fairly simply. At the world view level, however, the task is much more difficult and painful. It begins by explaining to the architects that in the advancing post-modern framework design has become a tactical activity, and as such it only marginally affects the excellence equation. Indeed, the most profound shift in the world view stems from the way "excellence" is defined. That architectural excellence is no longer considered to be synonymous with design excellence, and that a project may be construed as "excellent" in spite of the fact that none of its sub-systems have achieved optimization, is indicative of a new set of rules operative in the domain.

At the same time, the architectural domain has expanded not shrunk. The increasing aggregation of strategic decision making at the front-end, and an insistence by the owners and clients on the design and simulation of the entire procurement process up front, is opening up new areas where architects can play a very important role. For this, however, they need both a different kind of training and very different type of tools, neither of which are readily available to them at the present.

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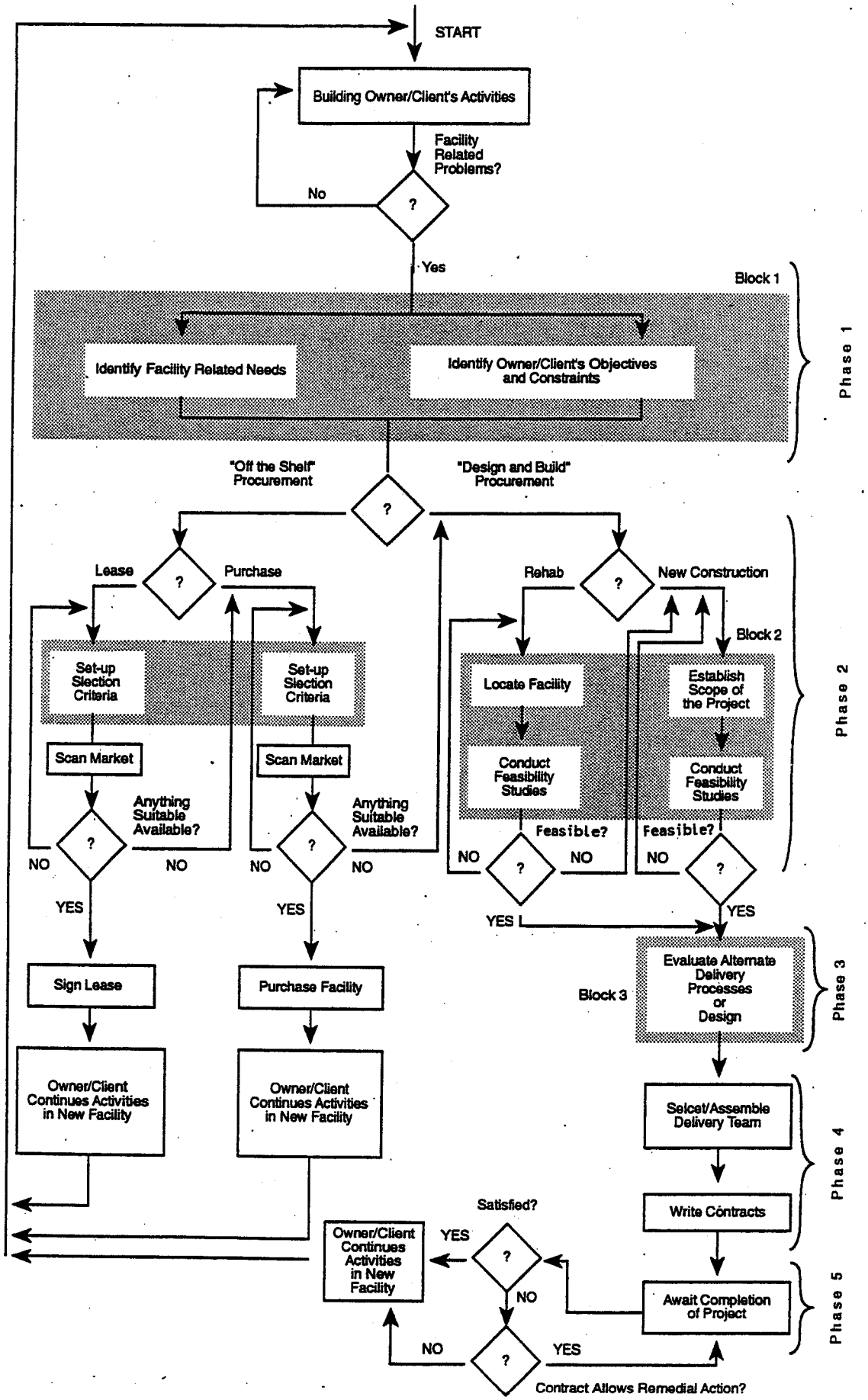
START
Building Owner/Client's Activities
Facility Related Problems?
No
Yes
Block 1
Identify Facility Related Needs
Identify Owner/Client's Objectives and Constraints
Phase 1
"Off the Shelf" Procurement
"Design and Build" Procurement
Lease
Purchase
Rehab
New Construction
Block 2
Set-up Slection Criteria
Set-up Slection Criteria
Locate Facility
Establish Scope of the Project
Scan Market
Scan Market
Conduct Feasibility Studies
Conduct Feasibility Studies
Anything Suitable Available?
Anything Suitable Available?
Feasible?
Feasible?
NO
YES
Sign Lease
Purchase Facility
Block 3
Evaluate Alternate Delivery Processes or Design
Phase 2
Phase 3
Owner/Client Continues Activities in New Facility
Owner/Client Continues Activities in New Facility
Selcet/Assemble Delivery Team
Write Contracts
Phase 4
Satisfied?
Owner/Client Continues Activities in New Facility
Await Completion of Project
Phase 5
Contract Allows Remedial Action?

FIGURE 1

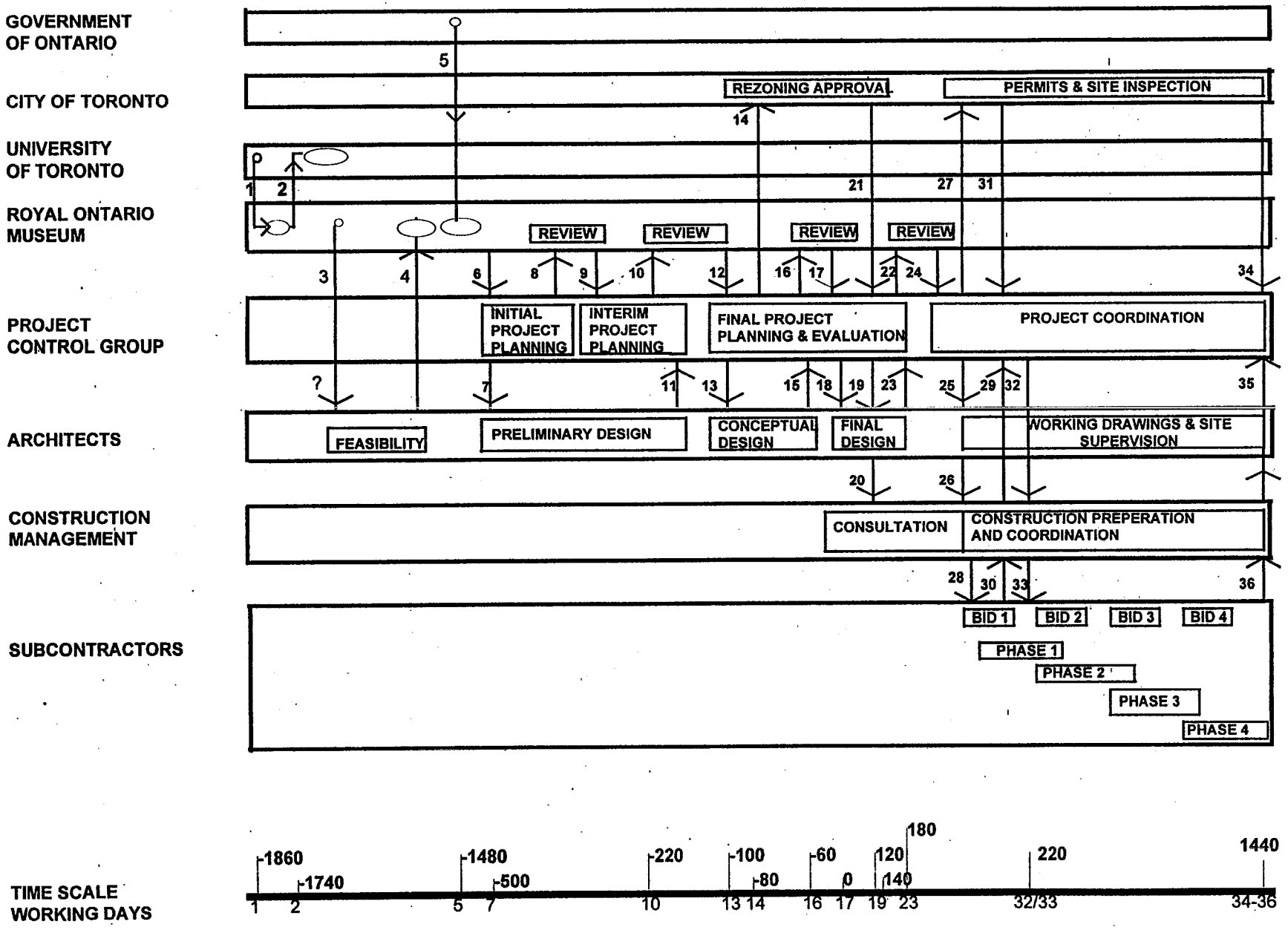

EXHIBIT: A Royal Ontario Museum

Explanation of the Building process Chart

1. Department of University Affairs requested the Director of the Museum to forecast the operating and capital expenditures for the next five years (May 1969).
2. The necessity for expansion and retrofit is outlined in a letter to the Deputy Minister of University Affairs (Oct. 1969).
3. Selected Architects requested to prepare expansion/ retrofit feasibility
4. Expansion/retrofit feasibility presented to ROM (Oct.1970).
5. Letter sent from the Minister committing $12.75 Million for the project (Dec.1970).
6. First meeting of the Project Control Group takes place (Dec. 1974).
7. Design Architects appointed (Jan. 1975).
8. A report entitled "Guidelines for Planning" presented to ROM (April 1975).
9. Board of Trustee's statement of Intent adopted (Sept. 1975).
10. Interim Planning Report presented to ROM (March 1976).
11. Design schemes A&B presented to the Project Control Group (Nov. 1976).
12. ROM instructs project to continue.
13. Project Control Group instructs the Architects to continue with the designs.
14. Rezoning application document delivered to the City Clerk.
15. Further developed schemes A&B presented to the Project Control Group.
16. Executive Committee agrees to recommend to the Board that Planning proceed on Scheme A.
17. ROM approves Scheme A.
18. ROM instructs final design be carried out (Feb.1977)
19. Construction Management Company appointed(Aug. 1977).
20. Same as above.
21. City Council approves rezoning application (Sept. 1977).
22. Final planning report submitted to the ROM (Nov. 1977).
23. Final Designs submitted to the Project Control Group.
24. ROM authorize to start construction.

25/26. Project Control Group authorizes start of the project to Construction Management Company (Jan. 1978) .

27 Application for building permit submitted.

28. Phase I goes to tender.

29/30. Successful bidders suggested to Project Control Group.

31. Building Permit is granted.

32/33. Contracts awarded to the contractors for Phase I. (Same process for the remaining phases.)

34-36. Acceptance of the project (May 1983).

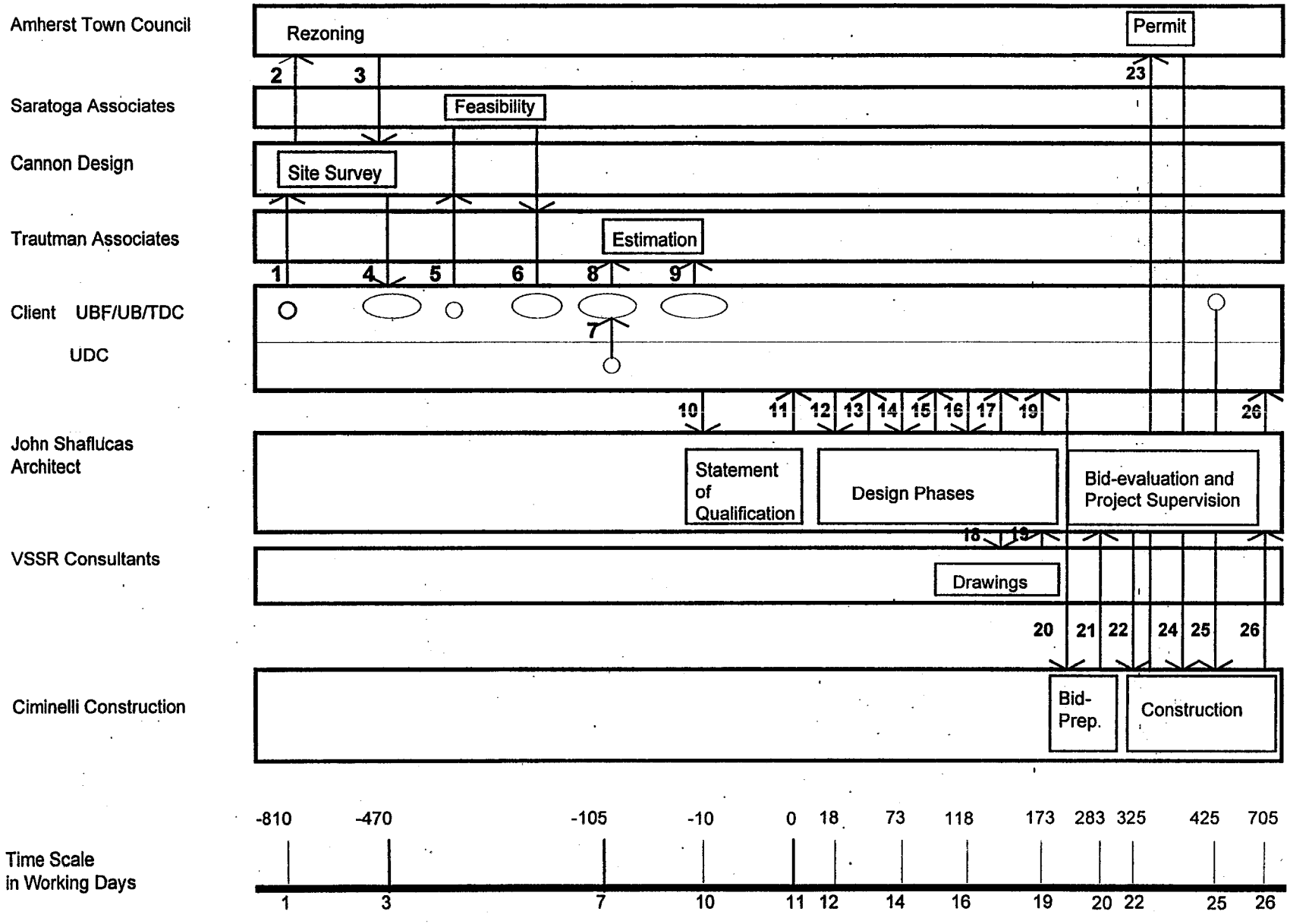

EXHIBIT: B Amherst Incubator

Explanation of the Building Process Chart

1. As the site for the proposed incubator was already available(on the 13 acre land donated by William C. Baird), the UB Foundation took the first step towards its development by hiring Canon Design to perform a site survey.
2. Cannon Design submit application for rezoning with the Town Council .
3. Rezoning approved by the Town Council.
4. Site Survey carried out by Cannon and deposited with the client organization(UBF) for future use.
5. UBF engage Saratoga Associates to perform a market analysis and conceptual plans for the incubator.
6. The completed market study is positive, and the conceptual plans shed more light on the requirements of the incubator facility.
7. New York State Urban Development Corporation is convinced of the important role the project could play in the economic development of Western New York, and agrees to provide funding .(Funding also came from Western New York Economic Development Corp.,New York State Science and Technology Foundation, UBF and private donors.)
8. UBF engages Trautman Associates to perform a conceptual cost estimate of the project.
9. Trautman Associates submit their report, indicating the feasibility of the project within the available funds.
10. UBF decides to initiate the design and build process. Invites four architectural firms for interview.
11. UBF undertakes evaluation of the architectural firms.
12. John Shafluca's firm is appointed architects for the project, and requested to prepare schematic design.
13. Schematic design submitted to the clients for review.
14. Due to the excessive cost implications, the architects are requested to redesign.
15. Architects submit revised designs for review.
16. The conceptual designs are accepted and the architects are given the green light to develop the preliminary design.
17. Completed preliminary design is submitted.
18. VSSR consultants are engaged to produce working drawings and other design documentation.
19. Design documentation is submitted to the client for approval.
20. Approval is granted and Architects call for bids.
21. Five bids are received and evaluated.
22. Ciminelli Construction, the lowest bidder, is awarded the contract.
23-24. Ciminelli Construction applies for a building permit, which is granted.
25. UBF makes changes to the incubator design (generic labs are developed).
26. The architect reports the project completed and the client accepts.