

# Why Can't a Building Be More Like a Machine?

BY M. GORDON BROWN AND STEPHEN E. ROULAC

## INTRODUCTION: THE INDUSTRIAL REVOLUTION SKIPPED REAL ESTATE

IN MY FAIR LADY, THE STAGE ADAPTATION OF PYGMALION, Professor Henry Higgins sings, "Why Can't a Woman Be More Like a Man?" What he is really asking is: "Why can't a set of rules that work for my half of the world apply to the other half?"

It's a question worth asking about real property. Real property accounts for approximately one-half of the world's wealth and nearly half of its economic activity. Like capital, labor and technology, real estate (land and its improvements) is a key factor of production. But what does it produce?

In 1947, *Fortune* magazine profiled major industries to assess the challenges and opportunities following the conclusion of the Second World War. About the housing sector, *Fortune* observed that it was the industry that the Industrial Revolution forgot, with building practices being as primitive as those in the time of Louis XIV. Real estate and its related industries have long lagged contemporary business. The subject matter and its practitioners have been parodied in multiple media ranging from Sinclair Lewis's classic *Babbitt* to the popular *Hawaii Five-O* television series, in which it seemed the bad guy was almost always a real estate developer.

The social systems, business practices, professional motivations and personal perspectives of those involved in the processes of creating buildings and places today are far removed from and very unlike their counterparts in most modern business undertakings outside of real estate. This is the case with respect not simply to manufacturing (the sector most associated with the idea of the machine) but also to marketing, financial management and so many other sectors of business that have employed an analytic understanding of systems and processes to transform the

world. In failing to appreciate how fundamentally different the world of corporate industry is from real estate, one-time presidential aspirant George Romney walked down the path of political oblivion. As HUD Secretary in 1970, Romney's much publicized and heavily funded effort to address the housing crisis through industrialized building methods, Operation Breakthrough, resulted in the construction of but 40 dwelling units.

In many ways today, the disciplines and sectors of economic activity associated with the creation of the built environment operate with approaches that have little relationship to those that have underpinned industrial progress. The result of the industrial revolution was the acquisition of hard-won axioms of organization and production that have been applied to the categories of capital, labor and technology. But, despite postwar efforts, the category of land remains somehow absent from this particu-

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## Why Can't a Building Be More Like a Machine?

lar period of human instruction. These axioms, exemplified in the vast array of contemporary machines, are not to be found in the way buildings and places are funded, designed, constructed and exchanged.

Advances in the property and real estate sectors have lagged far behind advances in society overall. The Industrial Revolution that occurred in the 1700s and 1800s preceded a similar Industrial Revolution now occurring within the property sector by approximately 200 years. Society has been operating in a post-Industrial Revolution mode for approximately the last two centuries. During much of this time, however, the property and real estate sectors have been largely in a pre-Industrial Revolution mode.

### MACHINE IDEAS

The Industrial Revolution was not a stand-alone revolution. The sixteenth, seventeenth, eighteenth and nineteenth centuries experienced extended, equally disruptive revolutions in knowledge, governance, organization, communications and capital that not only stimulated the Industrial Revolution but also benefited from it. Yet, because it enabled power-driven machines to liberate living beings from physical toil, it is the industrial revolution that is the touchstone by which we consider almost any aspect of everyday life in its relation to business, industry and commerce. The dominant world view that emerged from the industrial and its associated revolutions was a view filtered by the image of the machine.

As Mumford (1970) has shown, machine ideas were not exclusive to the industrial revolution. Nor were they continuously dominant. Romanticism countered machine ideas frequently. Yet, for whatever doubts there may be now about the machine worldview, it was felt for a long time to be a liberating and beneficial one. But in real estate, it rarely came into focus. So, why can't a building be more like a machine?

To ask the question, "Why can't a building be more like a machine?" is to raise questions about assumptions. For example, maybe the characteristics of buildings and machines are completely incompatible. Or, maybe a building is like a machine in ways that we don't really understand. Or, maybe it's not that buildings should be like machines but that the means of producing them should be more machine-like.

Although, because of its heavy reliance upon mid-20th century economic and financial paradigms, real estate thought might be considered mechanistic as opposed to, say, organic, there are no explicit references to the machine as an organizing idea in real estate, in terms of either the building itself or any part of the process that gives rise to buildings. Since real estate is largely a practical, rather than theoretical, discipline, ideas come into it from other

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sources. A number of ideas come into real estate through its long and uneven dialogue with architecture. Two dominant ideas—the building as machine and the industrial production of buildings—will be examined here.

**The Building as Machine**—Machine ideas abounded in and are associated strongly with early 20th century architectural modernism. In 1927, Le Corbusier (1982), for example, stated "A house is a machine for living in." A so-called machine aesthetic was characteristic of many modern buildings from the 1920s into the 1960s and has made periodical appearances thereafter. It is worth noting that it was in this modernist context of thinking of buildings as machines that the foundations of modern real estate analysis were laid.

But a machine aesthetic is not the same as a machine function. Le Corbusier did not really regard a house as a true machine that would transform raw material, merely that it should be without anything extraneous to the purpose of living as he presumed it should be at the time, as efficient and unadorned as a massive early 20th century power generator. He was also exhorting architects to pay attention to the work of engineers. With respect to buildings other than houses, there is little Le Corbusier said that would suggest he regarded them as machines in any

## Why Can't a Building Be More Like a Machine?

way other than metaphoric. Indeed, the idea of buildings as machines found itself often opposed to the organic ideas espoused by Frank Lloyd Wright. In architecture, the idea of a machine was no more than a metaphor used in an argument for function and against ornament, an idea that was shared to a great extent by many major and minor 20th century architects.

While the machine idea operated as a metaphor for most of architecture, it operated as a paradigm for an important exception—public housing. Public housing (social housing in Britain) had its start in the late 19th century and reached its zenith between the 1930s to the 1960s. The projects, as they were eventually called, were intended not simply to be replacements for substandard conventional housing but to transform their occupants into responsible participants in middle-class life. Yet, how they could do this by isolating their occupants and segregating them from the everyday aspects of middle class life is a mystery. Thus, it was not simply their frequently sterile appearance that suggested mechanistic thinking. It was the underlying paradigm, a form of social engineering. And what is more suggestive of machine ideas than engineering?

The so-called failure of public housing was attributed to their modern design although some have claimed the failure to be due at least as much to their mismanagement. The presumed failure of public housing design was one of the causes of architecture's dissociation from modernism, its social program and, along with it, the machine idea. A good result but for the wrong reason. By the late 1960s, there was another reason for architecture to abandon the machine idea: suburban development.

**Machine Production**—The procurement system employed to implement the construction of real estate projects still diverges materially from that in virtually every other major sector of the economy. Although the design/build movement has been afoot for a couple of decades, the prevailing method by which a real estate project is created involves five distinct and disjoint functions and entities providing goods and services to create the project. Whereas in the majority of industries the functions of design, engineering, parts production, assembly and sales are integrated into a single enterprise, in real estate these functions are most often provided by five different economic entities. The majority of real estate ventures involve five separate categories of companies providing goods and services to the overall project.

- Design services are provided by licensed architects.
- Engineering services are provided by licensed engineers.
- Component parts are provided by building materials suppliers.
- Assembly is managed by general contractors.
- Sales are the province of property marketing organizations.

The communication and interaction between these five parties is most often sequential, if not overtly adversarial. Engineers may be frustrated that architects are insufficiently sensitive to the structural implications of their designs. Contractors encounter plans and specifications they perceive (correctly or not) to be insufficiently articulated or uneconomic. Suppliers of building materials to real estate development projects are most often in a reactive mode, bidding to provide what is specified rather than having the opportunity to suggest what might best serve the project's profile and the user's objectives. The sales agent must deal with the project as presented, since the selling function rarely is connected to the research yielding meaningful input to the project to make it best serve prospective purchasers' needs and desires.

The contemporary procurement system for construction projects stands in stark contrast to the means by which other capital-intensive projects are designed, engineered, manufactured and sold. An automobile is a capital-intensive product whose complexity and functional utility challenges or at least mirrors how a building is constructed and used. What if five separate, independent companies were involved in designing the car, doing the engineering, providing the parts, assembling the car, and then selling it? While the sales process for a new car is through an auto dealership, which is most often a separate entity from the manufacturer, most dealerships operate with an ongoing association with the manufacturer, effectively serving as its agent. For the real estate development venture, by contrast, the five members of the development team that join together for a particular project may or may not have worked together before or expect to work together in the future.

Because, other than the developer, no one company that contracts and pays for the five companies' contributions to the final building project has an economic stake in the overall success of the project, each party to the venture is

## Why Can't a Building Be More Like a Machine?

motivated to maximize profits and minimize risks for only their component of the project, often through arrangements and behaviors that can be detrimental to the project's overall profitability and risk.

Like the procurement processes in real estate, the means by which properties are transacted diverge dramatically from those that apply in other segments of society. Integrated delivery approaches are not unique to manufacturing. Suppose the delivery of medical services were similarly fragmented with each patient constituting a separate project requiring separate sub-contracts to undertake diagnosis, testing, counseling, prescriptions and surgery. We would not have a healthy society. If the production and transaction processes of other sectors of the economy could be described as advanced, then the property and real estate sector is primitive. This primitiveness creates obstacles and barriers, but also opportunities and potential.

In sharp contrast to the transparent, dynamic, efficient, streamlined, expedited and economical attributes of transactions of financial interests in some other assets, such as the shares in business enterprises, are the murky, ponderous, cumbersome, complex, time-consuming, and expensive characteristics of direct real estate transactions. In many ways the rigid, unique, long lead-time, fixed attributes of property seem out of sync with the fluid, ubiquitous, instantaneous attributes that characterize so much of contemporary society and commerce. As long and difficult a process as it is to engage in and commit to a direct real estate transaction at the front end, it is an equally, if not more, time-consuming and complex process to disengage from a direct real estate investment.

In the years following the 1947 *Fortune* article, the house building sector of real estate was perhaps the first to respond to the problems of real estate production. Post-war suburban development was aided immensely by innovative mortgage practices helping returning GIs and the new road building programs exemplified in federal Interstate Highway legislation. But, these externalities would not have been enough for the prodigious housing production that did take place without a key ingredient. This key ingredient was the incorporation by some of the

new builders—Levitt and Sons, for example—of recently learned, large-scale, wartime logistics management practices. (Albrecht, 1995) It was in suburban housing development that the building industry could legitimately be

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called an "industry." Even though these practices did not engage architects in their traditional role as the owner's agent in a building project, some architects embraced and sought to innovate within these developments. The case study houses by Charles and Ray Eames in Southern California are classic examples.

There were enormous and heroic efforts from the early 1950s into the early 1970s to industrialize building practices. German émigrés like Konrad Wachsmann transmitted the best of European mass fabrication techniques to American architecture students and Alcoa undertook construction of aluminum houses. (Many still stand.) But generally, large-scale industrialized building could not be sustained and the idea that houses might be called "product" still galls many architects. With the exception of a few design-build architecture firms and "New Urbanist" architects, most architects are far removed from the problems of building. The architectural ideal remains a self-referential profession with attitudes toward real estate that may be characterized as 'arch' and less interested in the technology and context of building than in architecture as artistic expression.

### **SOCIAL AND TRANSACTION COSTS**

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## Why Can't a Building Be More Like a Machine?

pects. Those involved in the planning process, the building process, the development process, the financing process, and the facilities management process, as well as those who regulate and provide such social services as power, water, transportation, sewer, schools and police and fire services, are also culpable. James Graaskamp eloquently advanced the idea that these parties interact in ways that are adversarial and mutually suspicious, which inevitably compromise the prospects of efficacious and elegant outcomes (Roulac, 2000). The nature of the interaction between design-engineering-construction-finance-sales results in system-wide risk and diminished quality of any given project because each party pursues a self-serving risk-minimization strategy. The broader result, as is especially evident, is an overall collection of building projects that, as overwhelming commentary over the past decade has indicated, compromises the quality of the built environment.

Dissatisfaction with the built environment is pervasive. Over the past few decades, the idea of the machine has again fallen on hard times. The writings of Lewis Mumford, which addressed almost every aspect of settlement from the individual office building to regional patterns, were pervasively influential in removing the machine from its architectural pedestal. The post-war disillusionment caused by by-products of industrial production like pollution and congestion, obscure what was once so profound an enthrallment with the machine that, in early 19th century America, even nature was considered a giant beneficial machine. (Marx, 1967)

Many are dissatisfied because architecture is so ineffective and real estate is so effective. Contemporary concerns for sprawl, environmental degradation, traffic congestion, affordable housing, tarnished quality of life, space for growth and diminished community are vivid and troubling manifestations of the question, "Why can't a woman be more like a man?" Although considerable progress has been made, despite countless proposals, the approach is essentially incremental, isolated and narrow. Lacking is a comprehensive, systematic, and holistic approach that is needed to make the building environment operate in a manner more comparable to the standards of other segments of society. While architecture, building, and real estate disciplines have tended to operate as independent silos, an integrated approach is needed if the problems that plague the built environment are to be adequately addressed.

To raise questions about the disappointing results delivered by a disjointed approach to building and a fragmented real estate industry today suggests a form of market failure. It is saying there are serious social costs that are consequences of the fundamental structure of the real estate industry. This says, not just that the structure of the industry compromises the quality of its products but, that these social costs are externalities increasingly recognized as reasons for intervention. Think briefly of the need for affordable housing in so many housing markets in Western cities and the effectiveness of strategies being considered to address the problem.

One obvious perspective on this is the "Coase Theorem." Nobelist Ronald Coase proposed that problems often perceived to involve externalities coming from market failure and requiring intervention or subsidy are more likely to be problems involving transaction costs. Coase's work showed that, while there could indeed be externalities, if transaction costs were zero, there wouldn't be a problem, because the parties in the transaction would be able to make a deal that constituted an effective solution. The existence of unresolved externalities that have social costs can be traced to inordinately high transaction costs. Coase's thinking has had a major impact on thinking about the internet which clearly reduces many transaction costs for an indefinite number of parties.

Seen through the template of the Coase theorem, the huge advantage of the machine is that it not only replaces human manual (and intellectual) labor, it minimizes transactions costs that are brought about by a social division of labor. What is often not recognized is the underlying, centuries-old influence of the relationship between land and labor as established by contract. This remnant of feudalism and seignorialism is quietly built in to the underlying thoughtways of real estate and thus into its structure. It ultimately affects the cost of transactions. That real estate transactions have an exceptionally high cost relative to those in other sectors is widely acknowledged. Reducing them has been one of the prime desiderata of many researchers. Part of the problem in reaching this goal has been the lack of a suitable paradigm to guide work toward it.

### CONCLUSION: MACHINE AS A PARADIGM

The conventional idea of a machine is that it is a physical device organized to transform a set of material elements into something else. The machine idea inherited from the

## Why Can't a Building Be More Like a Machine?

industrial revolution is that of a machine operating on the basis of power or energy. This notion of machine gives rise to a number of related words like mechanic, mechanical, mechanistic and mechanism, each of which work in slightly different contexts. These can all obscure the more important aspect of what might be a machine paradigm, which suggests not what a machine is, or is like, or what is like a machine, but how a set of phenomena can be regarded for purposes of study and analysis. On the other hand, the machine idea deriving from the information revolution is that of a machine operating on the basis of communication and control. Put another way, a true machine (as opposed to a metaphoric one like a political machine) need not be a physical, material thing but a dynamic system that changes a set of behaviors that may be embodied in various material forms.

The idea of transformation inherent in public housing programs is the essence of the machine idea. In this way, machines constitute the advance of the science over pre-scientific transformative means, i.e. magic. Thus the essence of a machine is not its form or substance as a thing but its transformative impact on behavior. A true machine in the abstract is a cybernetic machine.

Cybernetics envisages a set of possibilities much wider than the actual, and then asks why the particular case should conform to its usual particular restriction... questions of energy play almost no part—the energy is simply taken for granted. Even whether the system is closed to energy or open is often irrelevant; what is important is the extent to which the system is subject to determining and controlling factors. So no information or signal or determining factor may pass from part to part without its being recorded as a significant event. Cybernetics might, in fact, be defined as *the study of systems that are open to energy but closed to information and control—systems that are "information tight."* (Ashby, p. 1/5, 1/6)

This begins to make clear at least one reason why the set of rules that have worked for one half of the world do not work for real estate. Real estate is not information-tight. To make it information-tight requires a rigorous and precise definition of the variables that are transformed in the process of being put through the real estate machine. Real estate transforms a vast and perhaps indeterminate number of variables. Trees and ore become wood and steel framing for houses and high-rises. Streets, sidewalks, doors and windows are all the results of transformations

of a variety of natural materials. Farmlands and wilderness become subdivisions. Airports become town centers. Rolling hills become graded vistas. Dilapidated blocks become new multi-family apartments. Warehouses become loft dwellings. Historic sites become parking lots. All of these are sets of transformations that, in the interest of information tightness, need to be reduced to one or more canonical elements. The simplest of these is space.

The real estate industry is a space-transforming machine that produces, configures and exchanges space contained in various forms. Hypothesizing space as both input and output makes it fully clear that the real estate industry functions indeed as a machine. But it is a machine lacking control. Indeed, real estate is a classic, but very messy, black box, filled with components whose relationship can never be adequately understood without tightening the information concepts which it uses.

The idea that space, as both a metric entity in itself and with its various non-metric attributes, is both input and output for the myriad real estate activities is both practically and theoretically supportable. Practically, almost all real estate performance measures are reducible to some parameter per unit of spatial area.

That the space of everyday life can be of theoretical interest has been addressed by Giddens (1982). That it has cybernetic machine characteristics was first proposed by Brown (1982). More to the point, the idea that the production of the space of everyday life has theoretical interest has been well developed in the context of social critique. What could better describe what real estate does than the following statement.

An existing space may outlive its original purpose and the *raison d'etre* which determines its forms, functions, and structures; it may thus in a sense become vacant, and susceptible of being diverted, reappropriated and put to a use quite different from its initial one. (Lefebvre, 1991)

So, why can't a building be more like a machine and why can't real estate function like other industries? Because the real estate industry hasn't had a paradigm that allows it to recognize that buildings can be like machines and that real estate can function like other industries. Recognition is the road to the reality of the better social goods that real estate can supply. ■

# Why Can't a Building Be More Like a Machine?

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