# Generative Codes

## The Path to Building Welcoming, Beautiful, Sustainable Neighborhoods

Version 17

Christopher Alexander

Randy Schmidt
Maggie Moore Alexander
Brian Hanson
Michael Mehaffy

November 2005
DRAFT

# A Simple Question: What Is It That We Really Need From The Neighborhood Where We Live?

Most of us share a general, intuitive understanding of the qualities we would like to have in the neighborhood around us. It is not very complicated.

A sense of privacy -- we are left alone when we want to be alone. Friendly people who know you, and whom you greet and occasionally talk to. Safety -- safety from violence, from theft. Physical safety from traffic and noise. Safety for children. Safety at night. A beautiful place -- something which lifts your heart when you walk around or look out of the window. Intimate and personal. Physical safety from traffic and noise. Safety for children. Trees and gardens. A place to sit in public that is really a wonderful place. Streets and public places where everyone feels at home, instead of where nobody feels at home. Uniqueness of the neighborhood, so we know it when we are home and when we get home. Water, perhaps..

And, of course, we also hope for these qualities in a newly built neighborhood, or in a refurbished neighborhood. This is the dream, one might say, of every developer. A developer with a conscience, who dreams of building neighborhoods, hopes and wishes to build for people, something that has these qualities.

Yet we all know that developers, rarely – perhaps if we are more honest, never -- reach this ideal. There is something about the way that things are set up, in the process of building houses, that prevents it, perhaps even virtually forbids it.

The reason is not hard to find. Making a neighborhood which has these qualities, is a human process. It is generated by a long chain of human events, involving respect for people, respect for one another, respect for land and place, and respect for age-old ways of making things: the origin of every genuine human structure. Above all it comes from the land, and it comes from the people.

When successful, it binds land and people together, into a social-spatial fabric or tapestry. When we list the items at the beginning of this section, it is that fabric or tapestry, of which we are dreaming. We will never get that kind of neighborhood, unless we consciously set out to make that fabric. The fabric must be generated by the processes we use. And in the processes we support, that try to build houses and public space and neighborhoods, it is this tapestry and fabric that must be generated. Without it, nothing valuable can ensue. With it, the neighborhood has a very strong chance of life.

Building that fabric, successfully, in modern society, is what this paper is about.

# What is a Generative Code?

A generative code is a system of explicit steps, for creating such a fabric. It defines the end product, not by specifying the end-product itself, but by defining the steps that must be used to reach the end product. Unlike a process which defines the end product, and then leaves the getting there to the developer, the processes initiated by a generative code assure that the end product will be unique each time it occurs, and will be unique in just the ways that matter.[1]

The generative codes we are concerned with in this paper, are the processes specific to the environment: our world, and its construction, especially in areas that we may roughly call “neighborhoods.” They are, to be more precise, codes which are capable of driving, or guiding, the organic unfolding of a neighborhood (new or existing or partly existing, green field, or brown field), in such a way that the neighborhood and the people who do and will live in it and work there, have a good chance of flourishing, personally, economically, and ecologically. Like the example of biological generative code, such a code is, necessarily, highly complex (in its effects) though simple (in its own structure). It is necessarily dynamic. It specifies processes, happening under a variety of types of control, which will contribute to the proper unfolding of the whole, and delineates the interaction of the people concerned in such a way that what results may, with good fortune, become a living neighborhood.

An example of a generative code in another context, is the thing known in surgical medicine as a “procedure.” It defines a surgical operation, in such a way that it can be learnt, and transmitted. Those who have learned it are able to apply the procedure to widely different individuals, with unique circumstances, and it will produce unique results, according to the idiosyncrasies of the patient.

Another generative code is the system which allows a plant to unfold from a seed – so far, even now, not yet precisely known in full detail. It used to be thought that the genetic information in the DNA was all that you needed to define the process, and so the end product. It is now known that the situation is very much more complicated, and consists of interlocking processes, taking place in different organs and organelles, chemical concentrations, enzymes, and interlocking sequences of action and production.

At one time in our recent history as a people, we underestimated the complexity of ecological systems, and only recently found out that crude mechanical methods of agriculture kill living systems, and destroy living species. In the same fashion we have, during the last fifty years, lived through an era where crude methods of urban development have given the impression of a capacity to create our built environment. We are now entering a new era, where the delicacy of this operation, and the delicacy of the procedures we must use to do it, are first becoming visible, and are becoming practicable. If we are careful, we may find, in the next ten years, that we do have the capacity to generate living neighborhoods on Earth. But the techniques we use, will turn out to be very different, and more subtle, than we previously thought. Like the other examples cited, the code itself is simple. But the result of the interacting elements of the code can be complex and beautiful.

The word "generative" also has an additional and crucial meaning. In a generative code, there is always a sequence, an order, to the instructions. The specifications which are provided by the code not only describe geometrical features (as in a form-based code like a zoning ordinance), but also describe the approximate sequence in which these features must be introduced to help the neighborhood become whole. This aspect of generative codes, novel for urban codes, may be described as the specification of an "unfolding."

The idea of unfolding is entirely straightforward. It simply acknowledges what has not been acknowledged up until now in urban codes, namely: That the order in which things are introduced is as vital as the specification of the geometrical features. This is common sense, and ordinary. It is a natural part of the specification of a surgical procedure, where sequence is paramount. It is a feature of virtually all biological specification and coding, where it is now known that DNA alone only bears a part of the responsibility for the ensuing form, and that the larger part is borne by the unfolding processes inherent in cell dynamics.[2] Unfolding sequence is even a natural feature of a recipe for baking a cake. There we are very familiar with the fact that an approximate adherence to the right sequence is at least as important as specifications of the right ingredients, if not, indeed, more important.

So this generative feature of urban codes -- that the code must contain a description of the approximate sequence in which the elements of the code are best brought forth in order that a living whole may unfold successfully from them -- is natural and ordinary. It is surprising that it has not previously been noticed, or implemented on a significant scale in anything we currently view as an urban code. Yet it is the decisive aspect which makes a code give life to a neighborhood.[3]

An urban code may be defined as generative when, and only when, it has this feature.

When generative codes are used in a process of development, the following characteristics typically get woven into the social-spatial fabric:

1. A more beautiful and coherent geometric form that is natural to the land.
2. More probable successful integration and adaptation to plants, trees, animals, and land form; resulting in communities and built areas which, like traditional towns and villages, seem like part of nature.
3. Successful fine tuning and deep adaptation.
4. More successful integration with living process in the daily life of the inhabitants.
5. Better fit with individual local needs of any given building, garden, space, or enclosure.
6. Far greater likelihood that genuine community will emerge in the new place.
7. More uniqueness of each place, each street, each building, and each project.
8. More profound linkage to sustainability and environmental objectives.
9. An easier path to the desired end state, described above.

# Historical Background

In the modern era, the first conscious, and deliberately thought out efforts to guide and control neighborhoods, were already types of code. These were the zoning ordinances, introduced in Chicago in the last decade of the 19th century. New York City adopted the first zoning regulations to apply city-wide in 1916 as a reaction to construction of The Equitable Building (which still stands at 120 Broadway).[4] The advent of building codes, in their modern form, also started in the 19th century. Yet what is generally accepted as the first building code was in the Code of Hammurabi dating to 1700 BC. And legal covenants, attached by deed trust to a particular piece of land, are also used in many countries, and may also be viewed as a type of code.

In all these cases the essence of the code was that it described, defined, and then required that certain geometrical or configurational features had to be present in the finished product.

Gradually, during the last two or three decades of the 20th century, the shortcomings of this prevailing, "old" system of urban codes became clear and inspired a number of major changes. The big innovation came in the late 70's and early 80's from Alexander's pattern languages, and from Andrés Duany's subsequent effort to introduce form-based codes similar to patterns as tools for guiding development in cities and neighborhoods. At first this movement, (by now world-wide), focused on the inadequacy and poverty of the older code elements themselves, and replaced them with NU rules that deal with sidewalks, front yards, windows, building facades, street widths, parking, mixed use, and so forth. Many of these rules represent a distinct functional improvement over previously existing ideas of development, suburban tracts, and urban housing. But like the elements of existing building codes and zoning ordinances, the elements of these "New Urbanist" codes are rules, enforced by law, which require that a certain number of geometric conditions are met within a neighborhood.

The result of this is more like a carefully-plotted piece of fiction than real life: for a time you might be fooled into thinking this is real, but sooner or later the hand of the author can be glimpsed.

However, the ultimate effect of these form-based codes on built projects is by no means universally liked or accepted. Indeed, a deep fear and suspicion of them pervades our culture – demonstrated by *The Truman Show*, and by the "Arcadia" episode from the 6th Series of *The X-Files*. This is for understandable reasons. First, the application of these codes, although intended to help developers do a better job of building neighborhoods, in fact have too little effect on certain other deeper things which matter more. The qualities listed at the beginning of this paper, simple basic qualities that all people desire, are still lacking; and though they may appear in developers' stated ambitions, developers rarely have any capacity for achieving them. The places built are, after all, still "developer built", and thus typically still have the inevitable taint of rigidity – sometimes coupled with a very large dose of commercialism. The people who live in these places inevitably feel like the inhabitants of a "machine for living." Negative qualities occur and are felt by inhabitants, in spite of the fact that the architects of the new form-based codes rightly see themselves as crusaders battling this very problem.

In short, the step to the new form-based codes, as far as it has gone to date, has not been strong enough to make a real difference in the process of creating vibrant and healthy neighborhoods that people genuinely care for. The difference between these new form-based urban codes, and older building codes and zoning ordinances, is somewhat positive. New Urbanist projects do make practical advances in pedestrian space and in the placing of cars, and towards mixed-use development. The rules have changed, have become more complex, and pay greater attention to important practical aspects of the habitable character of the ensuing neighborhoods. That is all positive, in principle, though sometimes too rigid. The geometry therefore becomes more different and more complex, more interesting, and possibly more useful, too. That is highly desirable since, without doubt, one of the things wrong with 20th century cities, lay in the fact that their geometry and layout, emphasized cars in undesirable ways, buildings were faceless, too slick, too gigantic, and tired.
But in spite of these advances, the products of new urbanism, in their geometry, still make only very small improvements to the human condition. The emergence of living structure, of real social life, is not really more firmly guaranteed by these new urban codes, than it was by the earlier, less pleasant combinations of zoning and building codes. In spite of the greater sophistication, results still tend to be lifeless. The shapes are different. But the inner social character, and the emotional health of the inhabitants, has not really become better. It is true that they slightly resemble traditional buildings, but for no obviously good reason. The emphasis is on their fake-traditional character, not on their inner life.

In short, you cannot change the soul of a person by putting on lipstick. Nor can you do this with architecture. The products of the new form-based codes have so far still been, essentially stylistic. Although they also contain certain practical benefits for living, they are fundamentally making changes only in the appearance, not in the underlying substance or social-spatial fabric of the communities they create.

This follows inevitably from the fact that these kinds of late 20th-century form-based codes focused exclusively on the geometry and little else. The failures of recent developments to markedly improve on the failures of the latter half of the 20th century show that you cannot build community among living groups of people, or repair land, merely by changing the rules of style and geometrical configuration. Even more succinctly put, you cannot make the world a better place to live in, by changing the style of the buildings. At best, this emphasis on style emerges from architects playing to their strengths; at worst, it is their way of staying in control.

What does make a neighborhood a good place to live in is the experience of inner psychological freedom, the freedom in the air, the possibility of unconstrained activity and interaction, an atmosphere of enjoyment and invitation to be alive. It includes a certain friendliness. It includes the sum of the activities and interactions that occur there.

For example, if trying to buy or rent a workshop in a neighborhood, we suspect that people would rather have a straightforward, plain, rectangular building for working in, than a cutesy stylized traditional cottage shape applied to a new structure which could make them feel like pawns in somebody's stylistic game. Anyway, the stylistic gesture is not necessarily conducive to a feeling of freedom for anyone, nor to a mental freshness in the air.

This liberating and nourishing kind of freedom, does not come from the style of the buildings; it comes from the way people feel ownership of the place, and that in turn comes *from the way the place has been generated*, and by the way that it is continuously being generated as its life goes forward.

Specifically we may say, in more detail, that this nourishing quality will arise in a place to the extent that three things are respected:

1. **The land**: What is built preserves and extends the deep structure of what is there.[5]
2. **The people**: What is built comes from the actions and wishes of the people who live and work there, not from a faceless corporation.
3. **The communal spirit that is felt**: The work of generating the place comes from the heart, and has, at its root, a spirit of communality and love of life that is palpable and can be experienced, because it is visible, and above all, because it is truly there. The social life of a neighborhood, comes about from the existence of a profound, articulate public structure in the space, which bestows community and the opportunity for community, on the people who live there.

We believe that certain recent experiments have now begun to demonstrate – at least on a preliminary basis -- that newly built neighborhoods which are created in this better and more generative way, fundamentally alter the way that people living and working there feel about the place, and about themselves.

We are very much afraid, that, though vitally important, these three considerations have so far been almost altogether missing from contemporary developer's development – the contemporary planning, architecture, and construction of new neighborhoods in England, in the United States, indeed, in most of the modern nations in the world. Development of

new housing estates, in all its late 20th-century and early 21st-century manifestations, has been widely criticized. The philosophy and thinking of new urbanism, emanating in large part from the CNU, the Congress for New Urbanism, though heralded and admired, has so far made little impact on the deeper problem, and has altered the situation in what are, so far, often superficial ways.

That is because new urbanism and its agenda have been built on the foundation of "modern development," as a process, without sufficiently questioning its assumptions or getting to the root of these assumptions. Because the new urbanists have wanted, so badly, to succeed, in a practical way, and to succeed in implementing large areas of built projects, they have embraced, without enough critical awareness, the machinery and the monetary and control structure of the modern developer, lock, stock, and barrel. That is to say, they have embraced the very thing that was, and is, the origin of most of our environmental ills in the first place.

In addition, they are also trying to solve the problem at the level of design, which requires some kind of "perfect blueprint," to be executed by a faithful builder or developer. But what we are learning now is that nature doesn't work that way, and the best projects are continually adaptive, not "master planned". The solution is going to have to be a new kind of design-build approach.

# History of Experimental Projects with Generative Codes at the Center for Environmental Structure

Work on generative codes, mainly in private contexts, began in the late 1970s at CES, Berkeley, California. We may summarize our experiences in these kinds of projects as follows:

Since the appearance of *A Pattern Language* in the late 1970s, my colleagues and I have been engaging in a long series of experimental projects, all designed to deliver communities and neighborhoods which are more "real," that is to say, more focused on the human aspects of spatial and social structure – how real people actually feel about their environment, and endeavoring to produce a built environment which makes people really happy, in their day-to-day lives. All these projects have been designed to overcome the shortcomings of modernistic architectural development projects, largely because they have used entirely different means of design, planning, production and procurement.[6] In recent years we have also been working rather consciously to make progress in the very direction where we observed our colleagues working on new urbanism and its form-based codes, have been most seriously at fault.

Unfortunately, the difficulties and challenges involved increase exponentially with an increase in scale. To obtain demonstration projects at a larger scale, therefore, requires some agency being willing to create a "bubble" in which a pilot project can take place.

To do this we have taken an intuitive approach, in which we place the feelings of people at center stage, and allow that to guide a process of design and construction which is able to produce the real thing.[7] This means, that we try to shape our procurement processes, in ways that improve human beings' sense of belonging to the communities that are created. That simple rule of thumb, that attitude, has guided most of our choices, and in so far as it has been practically possible, we have taken every step we knew to make this one aim the center target.

To achieve these results, we, like Andrés Duany and his colleagues, also took off from our own findings in *A Pattern Language*.[8] But the directions we took were different. The form-based codes made the attempt to codify and require that pattern-like entities be embodied in the geometry of the design, in the form of simply expressed and enforceable rules, while leaving the process of procurement largely unchanged. In our work, we paid as much attention as possible to the process, and tried to create (new) formal ways of supporting a more humane and more involved process which included the inhabitants and neighbors of the project in hand, and which had the intrinsic quality that it would heal the surroundings and heal the community itself. Thus, we consciously focused on the process that would generate the deep structure of the world we were responsible for, and it was this generative emphasis that gave our work its meaning and result. Hence the term *Generative Codes*, which has gradually emerged as the best descriptor of all the work we have been doing.

The following table shows a strong degree of correlation between the success of these projects, and the number of generative features of the development process by which they were created.

| ***Features of the Procurement Process →*** <br><br> ***Projects*** | | ***Primary focus on the growth of community as the main object of the procurement process*** | ***Pattern language by clients*** | ***Layout by clients*** | ***Layout on the ground*** | ***Drawings done after (not before) layout*** | ***Direct Construction management*** | ***Budget under our control*** | ***Subs directly control led*** | ***Is it honestly true to say that focus on the well being of the human community guided every phase of work*** | ***Number of Yes*** | ***Our own intuitive evaluation of the success of the finished environment in human terms and as a healthy and wholesome place to live, beneficial for the people who lived there—on a scale of 1-lowest to 10-highest*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Modesto[9] | 1975 | **YES** | **YES** | **YES** | **YES** | **YES** | NO | NO | NO | NO | **5** | **2** |
| Mexico[10] | 1978 | **YES** | NO | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **8** | **7** |
| University of Oregon[11] | 1981 | **YES** | **YES** | **YES** | NO | NO | NO | NO | NO | NO | **3** | **4** |
| Shorashim | 1982 | **YES** | NO | **YES** | **YES** | **YES** | NO | NO | NO | NO | **4** | **3** |
| Sala[12] | 1983 | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **10** | **6** |
| Guasare, Venezuela* | 1983 | **YES** | NO | **YES** | **YES** | **YES** | UNKNOWN | NO | **YES** | NO | **5** | **4** |
| Fresno[13] | 1985 | **YES** | NO | NO | **YES** | NO | **YES** | **YES** | **YES** | NO | **5** | **6** |
| Eishin[14] | 1985 | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | NO | **YES** | **YES** | **8** | **9** |
| Pasadena ordinance | 1987 | NO | **YES** | **YES** | **YES** | NO | NO | NO | NO | NO | **3** | **3** |
| Whidbey Island | 1988 | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **9** | **10** |
| Emoto[15] | 1989 | NO | NO | NO | NO | **YES** | **YES** | NO | **YES** | NO | **3** | **6** |
| San Jose[16] | 1990 | **YES** | **YES** | **YES** | NO | NO | **YES** | **YES** | **YES** | **YES** | **7** | **7** |
| Colombia[17] | 1991 | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | NO | **8** | **4** |
| Agate housing | 1993 | NO | NO | NO | **YES** | **YES** | **YES** | NO | NO | NO | **3** | **5** |
| Texas | 1994 | **YES** | NO | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **8** | **8** |
| West Dean | 1995 | **YES** | NO | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **8** | **10** |
| Sullivan | 2000 | **YES** | NO | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **8** | **7** |
| Sanders | 2004 | **YES** | NO | **YES** | **YES** | **YES** | NO | NO | NO | **YES** | **5** | **-** |

*Some of the experimental projects done by CES*

The two evaluations of the seventeen projects were submitted to a rank order correlation test.[18] Spearman's correlation coefficient ρ(rho) is .63 which is very high for such a small sample. This degree of correlation among seventeen items is significant at the .002 level, meaning that this correlation this high would have occurred by chance only 2 times in a thousand random trials.

The nine columns (3-11) stand for nine features of the procurement process, present or absent, in the way each of these projects was handled. One may say that these various projects turned out well in rough proportion to the number of **YES**s that appear next to them. "Well," in this sense, means that there is, to a strong degree in the resulting environment, a human satisfaction: the place is considered beautiful or pleasant; people report a wholesome feeling from being in the place.

It appears then, that the presence of these features in the procurement process correlates, positively, with the success of the ensuing project. So, after several decades of such experiments we may now say that our evidence strongly suggests that the following aspects of the procurement process play a vital role in people's satisfaction with the results.

- **The creation of a neighborhood always starts with respect for, engagement in, and careful enhancement of, the community life of the neighborhood even in its smallest details.**
- **Clients and users had a major part in the creation of the pattern language which was the basis for the generative code.**
- **To feel genuine satisfaction and identity with a neighborhood, the clients themselves and users must, physically, play a significant role in laying out buildings, streets, dwellings, and public spaces.**
- **Further, it makes a <u>real</u> difference when people do this on the ground, that means, walking around together on the land itself, placing strings, stakes, and markers, and reaching a state, in their minds, where they almost feel that the buildings are already there.**
- **It also makes an enormous difference to the success of the project if the plans are drawn FROM the stakes left in the ground (the opposite of what happens in typical production processes and housing construction procurement today). This can be achieved economically by use of high tech surveying methods which allow a direct translation of a field position of a stake, to the digital drawing which defines the project.**
- **Possibly the biggest single factor is the control of the project through construction management, not by a general contractor, but by a project manager who directly controls budgets, and subcontractors, and who is in touch all the time with the members of the community.**
- **Further, it makes a great difference if money enters in, explicitly, to the process, and the contract documents control the total contract price, but allow flexible reassignment of line item costs while the process moves forward, so that matters of importance can be addressed during construction, without raising costs.**
- **It is also vital that subcontractors are directly controlled by the architect and families, within the constraints of a project manager, so that many**

**hundreds of small adaptations can be made as the project advances, without causing delays or cost overruns.**

- **In conclusion, we believe that even when housing has to be built without community and without real people as clients, the creation of the housing must be handled in a form which introduces community and unfolding from the first minute of the first day. And the project as a whole is seen as a human endeavor, not as a technical endeavor, and that this human endeavor has as its continuing, principal object the day-to-day enhancement of each individual in the community, so that they can then give back to the community, the well being that they have received from it.**

**We believe, and to a first approximation we have demonstrated, that these nine aspects of project management and procurement are the ones which play the most significant role in allowing people to feel affection for the place, and in generating warm feelings among neighbors, and respect for the place they live in.**

# The Process of Procurement

From the very beginning of our experiments, the most important lesson we have learned over and over again, is that it is the process of procurement, above all, which **must** be modified. By procurement we mean the entire process, from the beginning to the end, starting with the first conception of the project, including the involvement of clients and potential inhabitants, including design and planning, processes of permits, budgeting, project management, construction management, contracts and subcontracts. Design is only a very small part of all that. It is certainly vitally important, but it is not nearly as important as the process of procurement as a whole.

The reason for this huge importance of the procurement process as a whole, is easy to explain. In the normal procurement process – the one that is standard for modern developers – the sequences of the project are rigidly divided into phases, and each of these phases is begun and completed, and then handed on to the next process. This entire present-day procedure is mechanical, and so, not surprisingly, the result is mechanical as well.

In the kind of procurement we have practiced, the different players pass in and out of the overall procurement procedure, very much like different threads of a multicolored skein of wool, where the different colored threads pass in and out and in again, while the threads together, all run in the skein from beginning to the end, and are all focused, always, on the well being of the whole.

To be more concrete. Consider the following players in a typical community:

Individuals who live there, initially, already
Individuals and families and businesses who are likely to enter the new community
Planning officials of the local authority
Architects who work with the community

Developers who provide some capital for the construction
Engineers who deal with soils, and/or with existing conditions requiring remedial action.
Project manager who oversees the process in its entirety
Community advocates who play a role in helping make sure that individual persons are represented and involved all the way along.
Banks or lenders who have a financial stake in the new neighborhood
Construction contractors and subcontractors
Craftsmen
Children of the families
Ecologists taking care of the existing fauna and flora
Local business support services

In a successful project, a project which captures the qualities we listed at the beginning, all these different types of persons and professionals are involved, and must be involved. But it is not sufficient for them to be involved merely at the beginning, or in some kind of token "meeting" or charette. All of these individuals pass in and out of the process, as it moves along. They contribute when they have something to contribute. Their entry into the project is managed by the project manager and architect.

For coherence of organization, their entry into the project needs to be managed by a project manager, possibly aided by an architect and others. Most important, and perhaps most notable, the developer is not the primary player, but rather, just one of the players, whose interest in the project is financial. But because he has a financial interest, this does not give him the right to control the situation. Rather he must play his role, appropriately, and help to nurture the complex process which is going on. In our view, it is the project manager who has the primary responsibility for bringing the different players in, at different times, and on many different occasions, as required, as the project moves along.

The generative code is the document which oversees this process, and provides the chart and organizational backbone for the project manager's actions, and for the weaving in and out of different players at appropriate moments in the process. This code sets out, as clearly as possible, the steps which must be taken, roughly with the order in which they must be taken, and with the people who are most appropriate, at each, to define the decisions as the whole unfolds. And this generative code is constructed so that the whole – the neighborhood, and all its personal and individual details, and all its subtle adaptations of buildings to one another, and to the land, are taken care of, gently, by the way construction management, and contracts, are handled.

In order to convey a concrete picture of the effect of a generative code, on the evolving community, it may be useful to give a range of examples of who is asked to decide what, at what time in the process of procurement.

- Existing businesses within the area of the neighborhood are protected, and integrated into the new construction so that current jobs, and economic flows are protected, and the community grows as a whole.
- Unfortunate housing and vulnerable families are supported by inclusion in the new neighborhood, and their unique characteristics are encouraged to become part of what emerges next.

- Main pedestrian places are chosen by community members, walking the site, and looking at the most beautiful places, beautiful views, and spots which have a settled feeling.
- Gardens are chosen, when possible, by the families themselves, so that their house is related to a piece of land they like.
- The internal layout of each house is made (whenever possible) by the family who will first live there, and they do it by placing blocks on the slab, so that interior walls and partitions are based on real feeling that has been checked in the place.
- Windows are placed from the inside of each dwelling, after rooms have been decided, so that views and light are as beautiful as possible for each room in the house.
- Ornament in brickwork, lead work, and interior plaster: inexpensive ornamentation is provided by the craftsmen, within a tight budget provided by the project manager.
- Outdoor walls, balustrades, seats, and fountains are provided by a community budget: householders in the vicinity decide on the layout, and provision comes from a line item in the budget allocated to this purpose.
- Public gardens and pedestrian main thoroughfares, are laid out with walks, trees, low walls, seats and fountains and views over local landscapes.

This is where the depth and power of the generative code comes from.

If we hope for a better architecture, we must learn, and acknowledge, that the subtle structure of a created environment depends almost entirely on the key features of the procurement process. It is the procurement process which must be drastically changed and drastically improved. And it is the generative code which drives the procurement process in such a way as to make it possible.

# Independent, Community-Oriented Project Management: The Operational Underpinning of a Generative Code

How then, is this to work? Most important, how does a generative code make it work?

The motive for making money must be tempered by a motive to create a beautiful and healthy neighborhood, with a coherent and integrated, caring attitude towards community, that brings quality of life to its inhabitants. That must be done through a new and presently unfamiliar organizational configuration.

In order to understand this, let us review the most basic project management tool: a PERT chart. A PERT chart describes the events which will occur in a complex project, the length of time that each event is likely to take for completion, the time sequence in

which these events must occur, and most specifically, the precedence relation between events – e.g. event A must be completed before event B can start.

In the field of construction these events are usually confined to the actual construction itself – although certain non-construction preliminaries (such as getting permits), may also appear on the chart, mainly because they have a crucial capacity for damaging effective completion, if not taken into account and undertaken in time.

Now, in pure building construction itself, it is perfectly obvious that different events or "jobs" are interdependent, and that the emerging whole we think of as the building, is unfolding gradually. This is in no way mysterious, and no one expects that the building is going to appear magically on a certain day. But in community building we face a different and more complicated task. The idea that planning, design, community building, adaptation, and so forth, are all necessary events, and necessarily part of the work of community building and healing the environment which must continue to occur, through the procurement of a building, is not yet familiar. Yet when we think logically about the myriad decisions and decision points that must, in a sensibly conceived building project, arise in an interdependent and sequential fashion – then the idea of design, planning, and even wider fields of expertise and cooperation in a building project, as being part of a network of interrelated actions, begins to appear as perfectly sensible. Indeed it is necessary and inevitable.

When we conceive such a situation, and consider the nature of the events which must occur, we have the first rough picture of a generative code, and how it must work!

The underlying motive in the correct development and building of housing, is human community. That is obvious enough, and is repeated by prominent politicians, such as John Prescott's speech to the CEU.[19] Here are some of the key points in Mr. Prescott's speech:

> "Sustainable communities balance the social, economic and environmental concerns of their community - meeting the needs of existing and future generations, and respecting the needs of others in diverse communities."
>
> "This is not just about buildings and public spaces looking good - they've got to feel safe, secure, and family friendly, as well. Sustainable communities must have good local economies and transport services - providing jobs, schools, health and other services that are accessible to all. Yet in Britain, successive governments did exactly the opposite, with terrible consequences."
>
> "We also saw the need to devolve power and resources away from the highly centralised form of government we inherited. Our reforms are giving people in regions, cities, towns and neighbourhoods more say over what happens in their area. It improves their confidence that they can make a real difference to their own community."
>
> "So I believe that we need a debate about the future direction of regional policy, its financing and how we can develop the professional skills needed to create sustainable communities and strengthen economic prosperity, use natural resources effectively, enhance the environment and promote social cohesion and inclusion. To this end, Britain's new national Academy for Sustainable Communities in Leeds will collaborate with partners across Europe to improve skills and partnerships between the professions to deliver sustainable communities. And we'll be working with the European Investment Bank to encourage investment in innovative projects that deliver

> sustainable communities. Of course, all European member states face many practical challenges to make sustainable communities more of a reality, and we should all learn from our past successes and mistakes. Sustainable communities is a big idea for a bigger Europe, a stronger Europe and a more democratic Europe. Sustainable communities is a vision which is exciting and will benefit more people. It's a belief that we can do things better. That we can - once again - create strong and sustainable communities. Places that can stand the test of time and reflect the pride of citizens in their community." (Address to the CEU, Berlin September 10, 2005).

It is plain from these quotations that Mr. Prescott fervently believes in, and recognizes the importance of true community building, which pays respect to the individuals who make up the community, to the land and traditions of each neighborhood, and is looking for ways of achieving it. This task of taking seriously the rebuilding of community, as the necessary foundation for all neighborhood construction -- house construction, small business development, roads, public space, green space, services, and habitability, children's places – must be at the root of a national policy.

It is very clear that this emphasis on community, cannot be accomplished by developers. They are neither professionally nor mentally equipped to do it; nor do they have the right emotional orientation; nor do the large-scale general contractors who work for them.

The items which appear in a generative code are capable, for the first time in any forceful public instrument, of dealing, explicitly, with the co-decision making of people in a community. They deal, explicitly, with the priority of community and individual values, and with the idea that these human values must have priority over all development policies, and over all methods of development which may be put forward.

We must now face the issue of money and profit, and focus especially on the current confusion between privatized action on behalf of social values, and the potential risks and realities of this proposal.

The focus on community, and the necessity of careful attention to many vital community issues which do not generate profit, has not been adequately discussed. It is no secret that developers are motivated, in most cases, by the opportunity to make money out of land, by increasing its monetary value. Most often this has been accepted by local governments and national governments who seek to justify and benefit, second hand, from the developer's profit motive, by being able to rely on said developers to do what the government cannot do or no longer wishes to do – that is, to provide the needed capital for the huge investments that are required.

However, there are abundant examples of ways in which this policy has backfired in recent years. The fiasco of private developers who are encouraged to take over public education at the elementary and secondary level is an excellent example. Rapidly, the developers moved to place priority on profit ahead of their educational aims, causing shabby education for the students. The romantic image of old-fashioned private schools as a source of excellence has no reality in these recently created schools, since present-day values do not correspond to the values built into those historic institutions which were solid, and untainted by the desire to accumulate wealth. The modern version of this idea, using developers who have no history of educational wisdom as money-making protagonists who do it for profit, from a distance, just does not work.

A similar problem has arisen in Leeds, Sheffield, and other cities, where property developers opt for massive land clearance, instead of selective infill. This has caused anguish among communities who see their own heritage, no matter how poor, being torn up by developers for whom it is less trouble to raze communities and build from scratch, than to build and heal, through carefully poised improvements and infill buildings, which requires more discussion; this is not convenient to the money-oriented machine.

**Very simply put, all community building, and in particular the kind of community building supported by the use of generative codes, requires an independent project manager as the chief of operations.** There are several reasons.

**First**, the subtle interweaving of decisions made by different interested parties in a community, can only be undertaken with success, by a person dedicated to this task – not only to the bottom line. The field of project management, especially if coupled with people from a social service background – anthropologists, community field workers and so on -- can deliver the community project in a way which does achieve a built and grown community.

**Second**, it is the specialized field of project management which trains people to thread their way through such complexity, while holding fast to cost and time targets.

**Third**, even this will only work when the project manager, or project management team, are independent: that means, are able to stand completely outside the profit cycle, and are untainted by the mixture of motives which present day construction and development are inevitably subject to. Indeed, it is not only the overall process set in place by the generative code which must be handled on a project management basis. We believe that the construction activities themselves must be run by an independent project manager, who controls subcontractors directly, not thorough the conduit of a general contractor.

**Fourth**, the project managers can be placed in a reliable and ethically sound position, only by a form of payment to them which is a fixed fee, the fee being set as a fixed percentage of project cost. It is our experience, that this arrangement generates trust, and of course, has the effect that all money saved is run back into the project construction funds, and so then accrues to tangible improvements in the project. Any form of arrangement, by developers, contractors, or project managers, which allows savings in the project to go to the pockets of the individuals and companies concerned, works against the community, and ultimately robs the community of just that increased value which the project management plus generative code are capable of bringing in.

It is also our sad experience, gained on many continents, that whenever standard contracting arrangements or standard development arrangements are in place, whenever an opportunity arises for money to supersede human values and the human value of the community building process, then sooner or later the project goes wrong. Whether it is small scale petty thieving (80 sheets of plywood double billed on successive invoices), middle scale (routinely tripling cost proposals for change orders) or large scale (motivations for land deals which encourage a developer to make inappropriate suggestions of land coverage and density in order to further their own financial aims) – the result is always the same. It is not only the petty and major thievery which causes harm. What causes the most harm, is that in such a climate, no one associated with those

motives can maintain clean hands – and the really important issues of individual participation, community trust, the health and welfare of land, trees, houses, windows, seats even, paths, and gardens – all become tainted and ultimately destroyed. This is not a pretty picture, but it is familiar to all of us, from countless development projects, in countless nations.

For these very reasons we have operated for thirty years as non-profit contractors and developers. People have trusted us because we wished to strengthen the basis for strong communities, which became possible only because we operated outside the predominant system.

Of course, the all-important question remains: What is to be the source of capital? If developers, who currently supply the much needed capital, are put out of the picture, where is the money going to come from. There are a number of possible solutions:

1. Developers are invited to take part as financiers, but their return on investment is carefully regulated, and they are, in future, not entrusted with running the development process itself, nor allowed to tamper with the community inspired aspects of the process.
2. Government finds ways of providing loans to other institutional entities at the community level, such as loans to non-profit land trusts, and groups of individual house owners.
3. Possibility of non-profit developers.

No doubt other solutions can be found by industry players who are committed to building vibrant, sustainable communities, here and abroad.

But it is in any case imperative, if we are to fulfill the vision put forth by John Prescott and others, that the dangerous effects of the system now in place be understood, and that the community building motive be allowed to take its place both next to and ahead of the profit motive. Our experience suggests some promising avenues to explore. As a starting point, independent, community-oriented project management must be supported as the major tool of development, together with generative codes of the type we have described.

# Placing Practical Emphasis on Respect For Individuals, Respect For Land, and Respect for Continuity.

To further explain our misgivings about the current procurement process, we offer this analysis. The “standard process” that has been in place for about half a century – works through a very limited kind of efficiency which is, at its core, mechanical. It uses mechanical efficiencies, mechanical forms of cost accounting, mechanical approaches to

human work, and mechanical approaches to profit. In order to achieve the results we have been able to achieve, we had to intervene in the procurement process. We did this, essentially, by starting from scratch and by rebuilding the procurement process from the ground up. We did not do this by appealing to any theory, or to any pre-established notion of how it should be done. Rather, we simply did it by doing whatever it seemed intuitively necessary to do, to get right results – that is results which were intuitively wholesome, which engaged peoples affections, and which led to results that made people happy, and made the environment healthy.

Our experiments in procurement were, in many cases, risky, since we needed the courage to try methods in which we had little experience. It was part of the given, that we had to take control of decisions which we had not been trained to take, and where we were trying methods and procedures that were, in many, many cases, untried. We had to risk failure; we had to use the compass of instinct even when those who believed they "knew better" advised us against what we were doing on the grounds that it was risky.

We did our own contracting.
We used new kinds of contracts.
We worked to fixed cost.
We engaged the people for whom we were working, in the initial pattern languages.
We engaged people in the actual layout process.
We used physical models and full size cardboard and tape mockups to settle difficult points.
When necessary we modified building code requirements on our own steam.
Staying within budget was always a vital part of the process.
We allowed time to slip, when that was necessary.
The one thing that led us, was always, the health of the whole.
This took priority over everything else.

From what has been said before, the morphogenetic sequence – the sequence which permits coherent unfolding of the whole – does not easily fit together with the present practice of development, whether this be free private enterprise development as practiced in the US, western Europe; or whether it be the kind of government sponsored housing undertaken by local authorities or federal and state governments.[20]

In either case, the developer takes the risk, the bank lends money against this risk, and the insurance against risk which both developers and banks experience, is provided by a highly rigid and mechanical process. Unfortunately, that makes the recipients of the housing -- the public who walk and use the land within these areas – pay an immense price for this insurance: namely, that they have an environment which is inhuman, sterile, and impersonal, thus disconnecting people from society and from land.

**So the central practical question is this:**

Are there ways of modifying the bank-development-society machine, which allow morphogenetic unfolding to occur, and which therefore allow respect for people and land, to be assured by the unfolding of plans, designs, and buildings – and all to be done in a way in which clients, inhabitants, buildings, banks, developers, and local authorities become encouraged to begin making a change in this direction?

Based on our experience we believe the following practices are imperative:

- **Project management is a major way of driving this approach**
- **Developers must have a social license (i.e. society starts to require this of them)**
- **Discussion of characteristics of developers who have been able to implement generative codes.**
- **Cooperation with planning authorities, separating cases where owners are resident from cases where owners are non resident**
- **Establish a basis in law, which requires greater responsibility and responsiveness from developers.**
- **Insurance from uninvolved non-profit trusts which are willing to underwrite the risks.**
- **An analog of Grameen Bank model, based on a system of small loans helping people fix up their houses and extend them.**
- **Local codes or zoning ordinances which require just those characteristics of process which will make generative codes possible and implementable.**
- **Making the local authority pay more attention to families and communities, than to the developers.**

# A Decisive and Lasting Change

This decisive change, if it is to take root, cannot avoid a confrontation with the issue of development as we currently understand it, and developers.

In the last fifty years, it has almost always been assumed that the way to get construction of neighborhoods to meet the growing world population, is through the "good offices' of a developer: a person, or an institution, who is willing to take the financial risk, undertake the huge effort of management, and who, in short, will get things done.

This is, of course, a rampant nod to commercialism, which, if we did not live in such a commercial era, would be seen for what it is. The life of a community cannot be held hostage, by a person or corporation who seeks to make money and profit from the construction of its streets and buildings. The streets and buildings are part of the neighborhood's life blood, the city's life blood, and they must be interwoven with the activities and life of the people themselves. Anything less leads inevitably to drug abuse, crime, teenage violence, anomie, and despair – the very earmarks of modern urbanism.

This mistake has been so deep seated that in the United Kingdom, for example, the Labor Government, and specifically the office of the deputy prime minister, Mr. Prescott, have laid their entire program on the foundation of development as usual -- on the primary role of the developer. In the programs which this government has set in place, it is the developers who tell the city what to do. The people, in their natural

communities are bought and sold, and held hostage, by a very few developers who are far too careless with the lives of those for whom they are ostensibly working.

But thousands of years of experience tell us, repeatedly, that no matter how benign the fox, you cannot have the fox guarding the chickens, and expect the chickens to be well.

**The reorganization of development, creation of new legal controls and guidelines which fundamentally alter the way a developer enters into the growth process of a community, must be the bottom line of a successful policy for building and rebuilding neighborhoods. Generative codes, together with the radical shifts in power and control, and changes in responsibility of planning officers, inhabitants, and builders alike, are we believe -- in one form or another -- the only possible foundation for the way successful neighborhoods can be created. This must become the foundation of a national policy on neighborhoods.**

# Notes

[1] This approach to building is based on *morphogenesis*, which has been the basis of Alexander's work throughout his career as architect, planner, educator, theorist and builder. The theory, connections to other fields of science, and hundreds of examples of putting this theory into action are covered in the four books of *The Nature of Order*, Alexander's recently completed four-volume work.

[2] For example, Brian Goodwin, *Form and Morphogenesis*,…

[3] *NOO* Book 2 , throughout.

[4] See Wikipedia, under the entry for Zoning law.

[5] See discussion of structure preserving transformations in Book 2, chapters 3 and 4. Perhaps explain more.

[6] The word procurement, though in common use, does not have a single established meaning. In this essay, we define procurement to mean the sum total of institutions and processes and actions which together contribute all that is required as a part of the design, planning, and building process, and that spans, in short, from conception of a project to the final stages of occupation and beyond, to maintenance and refurbishment.

[7] Commentary in the professional literature has openly acknowledged this aim of ours, and given us credit for some success in that direction. See, for example "The Real Meaning of Architecture,", *Progressive Architecture*, 1986, pages xxx-xx?

[8] Duany has generously said this, himself, on numerous occasions. Xxxx. Documented in a number of

[9] A community mental health center for outpatients and outpatient care built in Stanislaus County, California.

[10] A small group of houses and community buildings built by families themselves, with the help of students from the Universidad Autonoma of Mexico, and a team of builders from the Center for Environmental Structure.

[11] A master plan for the University of Oregon, Eugene, Oregon, which gave primacy to the use of pattern languages and user design, in the continuous process of development of the campus. See *The Oregon Experiment*, by Alexander et al, Oxford University Press, 1975.

[12] Two connected houses built for the Sala family in Berkeley, California.

[13] A farmers market we built in Fresno, California, serving growers and farmers for a wide radius around Fresno. The social phenomenon that was created has been written about in xxx, xxx.

[14] A high-school and college campus built outside Tokyo during the period 1983-87. It accommodates some 2000 students, and occupies about 9 hectares of land, some 9 city blocks, including 30 academic buildings, playing fields, public space, pedestrian space. This campus has been written about on numerous occasions, refs, and is also the subjects of two as yet unfinished books, *Battle*, by Alexander, Neis et al, and *The Human Aspect Of The Eishin Campus*, by Hisae Hosoi.

[15] A five-story apartment building in the Komagome district of downtown Tokyo

[16] A 100-bed shelter for the homeless, built in San Jose, California.

[17] A neighborhood for seventy families who laid out and built their own houses in the town of Santa Rose de Cabal, in the mountains of Colombia.

[18] It is important to emphasize that both evaluations (that of column 12 and that of column 13), are assessments we have made ourselves. It could be argued, rightly, that this is not sufficiently objective to be relied upon, as evidence for a finding. However, we have done our best to be objective about the evaluations, as far as it is in our power to be so, and it must be said that the correlation itself, even as a hypothesis, is of such importance to be published. In the absence of more purely objective data, these data are at least very much better than no data at all. We would encourage performance of a comparable, more carefully controlled, longitudinal study of construction projects in which the same variables may be tested further.

[19] See John Prescott, address to the CEU, Berlin September 10, 2005

[20] For fuller discussion of morphogenesis see "Sustainability and Morphogenesis", the Schumacher lecture 2004, October 30, and various references throughout Book 2 and 3 of *The Nature of Order*.