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IMPLEMENTATION ISSUES FOR TRANSIT SENSITIVE SUBURBAN LAND USE DESIGN

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Abstract

Recently, there has been an emergence of new approaches to suburban land use design in the United States which is more transit friendly. These include traditional neighbourhood development projects, pedestrian pockets and corridor based design. This paper will discuss the issues that are involved in the implementation of such techniques.

INTRODUCTION

Land use design to facilitate transit, bicycle and pedestrian use is a concept that has recently drawn substantial attention in the United States. Local government officials, transit service providers and concerned citizens have looked at these approaches as a means to give greater choice to travellers and as a way to have more efficient land use patterns and public services. Transit sensitive land use design is a process where land use patterns that are oriented to transit use are located along designated transit corridors and high quality access facilities are provided to effectively connect transit with buildings. These concepts are also called transit friendly design, neotraditional neighborhoods or transit oriented development. They draw upon techniques common in the United States up until the 1950's and have been the subject of revived discussion. Guidelines have been developed to assist in transit sensitive land use design and they have been subjects of numerous conferences and special seminars.

A key question that accompanies nearly all discussion of transit sensitive land use patterns is the question of implementation. Can such techniques be in fact implemented and change patterns of land use? What barriers are there to implementation? Sceptics of the concept say it can't be done, or if it is done it won't work. Little systematic work has been done to address the issue of implementation nor has there been any major efforts to understand in what ways such techniques become adopted practices. This paper is intended to shed some light on the topic and to provide a discussion of the process of how new concepts in land use design might find their way into actual practice.

The paper is based on several perspectives. First, the authors have worked for several years on the development of guidelines for transit sensitive design (Beimborn et al. 1991), and also have experience and expertise in real estate economics. Second, they have been involved in work dealing with technology transfer including analysis and definition of how innovations and new ideas are put into practice in public agencies (Beimborn et al. 1986). It is this latter work that provides the basis for this paper. The technology transfer process will be described and will be applied to help understand the issues and opportunities for implementation of transit sensitive land use design. This will help to define strategies for implementation.

TRANSIT SENSITIVE LAND USE DESIGN GUIDELINES

Previous work identified a set of guidelines that can be used to create situations where transit/pedestrian and bicycle facilities are used as a basis for land use design. These are shown in Table 1.

There are three major guideline categories: (1) Administration and Policy, (2) Systems Planning, and (3) guidelines related to the Design of the Transit Corridor Districts. The systems planning and district planning guidelines each have three parts: land use, access to transit, and transit operations guidelines. Systems planning deals with the overall location of transit corridor districts, access to public transit and general rules for the operation of transit services. District level planning relate to the way in which land uses are arranged within a transit corridor district, how access is provided and how transit services are accommodated. Policy guidelines are not site specific and relate to how things are implemented, who has input in the process and how services and areas are managed.

THE TECHNOLOGY TRANSFER PROCESS

Most organisations, particularly public agencies, are poorly equipped to deal with rapid change and innovation. There is a natural, built-in resistance to change and initial opposition to anything new. Most new ideas are greeted with comments about why it won't work here and criticism. New

procedures, if adopted by management, often have to be forced upon unwilling users and it may take a long time for changes to be successfully implemented. People at lower levels of an organisation who want to make changes are often frustrated by endless barriers to change and opposition by management. Management similarly may be frustrated by the unwillingness of their subordinates to accept change.

Table 1 Transit sensitive land use design guidelines

Administration and policy guidelines	System planning guidelines		District level guidelines	
Modify state and local policies to include transit as an element of land development.	*Land use design*	*Access systems*	*Land use design*	*Access systems*
Zoning should encourage transit-sensitive land use design through the designation of Transit Corridor Districts (TCDs).	Predesignate a future system of transit corridors.	Control of through automobile traffic.	Designate type and location of transit.	Pedestrian/bicycle pathway system.
Provide for transit-sensitive review of site plans and development proposals.	Separate transit-oriented and auto-oriented land uses.	Use corridor for primary pedestrian, bicycle and transit movement.	Provide mixed land use including housing, office, retail, light industrial and recreational uses.	Provide for safe, convenient pedestrian circulation.
Provide transit checklist for potential developers.	Establish transit service zones along existing arterials.	Avoid need for shuttle service.	Relate design to market.	Promote bicycle access through high quality pathways and secure storage systems.
Parking requirements in TCDs should reflect availability of transit services.	Explore public/private opportunities for transit stop joint development.	*Transit Services*	Provide variety within the district.	Provide for feeder bus and auto access points.
Establish a Transportation Management Association to oversee transportation services and land use development along the transit corridor.	Provide adequate population size and density to support transit use.	Highway/transit relationship.	Land use density gradient.	*Transit Services*
Provide a mechanism for transfer of development rights (TDRs) for the land surrounding the TCDs.	Design for a phase implementation of transit corridors.	Provide high quality transit service.	Utilize appropriate land use adjacencies.	Technological and infrastructure flexibility.
		Transit vehicles should be quiet and have low air pollution levels.	Provide recreational opportunities and amenities.	Provide for high level geometric design of transit corridors.
		Identity: Signage and compatibility of stops.	Accommodate multiple developers and development patterns.	Provide for handicapped access.
			Relate the design and connections of adjacent developments across 'seams'.	Provide for passenger safety and security.
			Parking density gradient.	Provide regular maintenance at transit stops.
			Develop a program to encourage shared parking facilities.	
			Minimize the distance between building entrances and transit stops; provide logical connections between buildings and transit.	
			Building location and design should be sensitive to transit-generated noise and views.	

While such problems may always be with us, it appears that there are methods to understand the process of change and methods to help it along. One such method is through an explicit technology assessment and transfer process. Such a process combines better understanding of the users of innovations with understanding of the innovation to identify barriers to implementation and to develop strategies to overcome the barriers. Such a process has the following basic steps:

(a) User assessment.

(b) Technology assessment.

(c) Develop transfer strategy.

(d) Evaluation.

These activities are described below.

User assessment

Before any significant progress can be made in the adoption of an innovation, it is essential that the nature of the potential users of the innovation be clearly understood. An explicit user assessment should take place. This would include a discussion of user needs and problems, an understanding of user attitudes towards change, an assessment of user capabilities to understand and utilise the change, an assessment of user networks (how do they interact with their peers?) and an understanding of the organisation in which the user works. User assessment is a continuing process and is done through one-on-one discussions in an informal setting and through good communication between users, developers of innovation and technology transfer agents. Information about innovations must be clearly understood by its audience in order for there to be effective implementation.

Technology assessment

A second activity is the assessment of the innovation. Technology assessment is a process whereby innovations are carefully examined to determine how easy it will be to implement them with a given group of users. In this case, the word technology is used very broadly and simply refers to a new idea, concept, procedure or product that has potential for future use. Technology assessment assumes that the innovation is feasible and promising and focuses on the barriers that it may have to adoption. Some of the questions asked are:

(a) What is its relative advantage of the innovation over current techniques? A significant advantage is required to make it worthwhile to adopt an innovation.

(b) How easy is it to try the innovation? Those innovations that require a long term permanent commitment that is difficult to change are much less likely to be adopted than those that can be tried for a short period on a temporary basis.

(c) How observable are the benefits of the innovation? It is important to have direct, obvious effects from a change in order to successfully implement it.

(d) How complex is the innovation? The easier it is to understand a change and why it is being done, the more likely it will be accepted.

(e) What does it cost to implement the innovation? Generally speaking, the less costly a change is, the more likely people will be willing to try it.

(f) What are the consequences of a failure? This is perhaps one of the most critical questions. People in public agencies tend to be very fearful of failure and avoid taking risks. An innovation that will cause serious problems if it fails is very unlikely to be adopted even if the chances of failure are very low.

Develop transfer strategy

Once there is a clear understanding of the user and of the innovation, it is possible to develop a strategy to implement the change within the organisation. Ideally this is done with a strong user involvement in order to identify problems at an early stage and to modify the innovation as necessary to lead to a successful implementation. The transfer strategy may include well developed training programs, specifically targeted dissemination material, opportunities for feedback, and a sequence of implementation and demonstration projects. The techniques chosen should consider the needs for timely information, adaptability of the process.

Evaluation

The final activity in technology transfer is an evaluation of the success of the innovation. Feedback must be obtained to determine the reaction of users to the innovation as well as to the means that were used to implement it. An evaluation also needs to be made of the effectiveness of the innovation itself in solving the problem for which it was proposed. Evaluation is important because it will help tell us what worked and what didn't and how to modify systems now and in the future so that they work better.

The process described above should be a continuing one with broad participation. It requires unique individuals who are able to lead others to adopt changes and who are unselfish towards others. This process has a good potential for bringing order to an agency undergoing rapid extemal and internal change.

APPLICATION TO TRANSIT SENSITIVE LAND USE DESIGN

This framework can then be applied to land use design concepts. There are multiple land use concepts which should be analyzed. Our earlier work identified 44 guidelines for transit sensitive land use design. Each could have an assessment by itself and the ease of implementation would vary based on each concept. Such an analysis is not possible in the framework of this paper. However, much can still be leamed by doing an assessment of the general concept. This will help to identify potential barriers, the likelihood of implementation and steps that can be taken to facilitate implementation.

User assessment

There are three categories of users who are involved in this innovation—developers, local government staff and the market itself. Developers and those who finance development are a key group in that they must be willing to take risks to adopt the innovation. As a group developers tend to be very open to change and will quickly adapt to new ideas. Projects that are successful tend to be quickly emulated by others. Indeed, there is a tendency for the development community as a whole to overreact to success which results in overbuilding and oversaturation of a market by sometimes too eagerly following a trend. Developers are also highly market driven and highly focused on the bottom line of a project, ie in the US this is a focus on the after tax return on their investments and how the market responds to it.

The second group of users are the technical staff, elected officials and appointed commissioners of local government which set the framework for land development decisions. These individuals react to development proposals and set the rules and requirements which can assist or retard innovation in land use design. Fear of failure tends to dominate actions by technical staff in many locations, hence they avoid risk and may create barriers to innovation. The local level tends to have the greatest scepticism to innovative land use design and may react by overregulating or by adding requirements that could compromise the integrity of an innovative design. Resistance to the change may be higher at the local government level than by developers, even though the burden of risk is mostly with the developers. Substantial differences may exist between

communities in the reaction to innovative land use design. Visionary individuals can be found at a number of locations and become "early adopters" of new technology and need to be nurtured, encouraged and acknowledged if they are to continue to be receptive to innovation in the future.

Table 2 User groups and their characteristics

Developers	Developers and those who finance development are the key group to adopt the innovation. Developers rapidly adapt to change, new ideas quickly spread, successful projects quickly emulated (tend to overreact). Highly market driven. Focus on after tax return on investment.
Local Government	Technical staff, elected officials and transit agencies. The first two groups know very little about transit; there is little communication between each of the groups. Fear of failure dominates decisions by technical staff.
Market	People who choose where to live, work and shop. Some key market segments that could be targeted for transit sensitive land use are two car families, two employee households, elderly, single person households, and employers with labor shortages.

The third group which is important for this innovation is the market. People who choose to live, work, and shop in an environment that may or may not have good transit, pedestrian or bicycle access. The market for such development is diverse and needs to be further segmented into groups that could be targeted for transit sensitive land use. Some market segments that could have higher potential are two worker households, elderly, single people, employers with labor shortages, etc. Work is needed to understand what types of market groups will respond to transit sensitive land use design and to better understand their concerns and characteristics.

All three groups share a common lack of knowledge in public transit and/or generally view it in a negative way. Most cannot conceive of using transit for their basic travel. There is a lack of basic knowledge of the basics of good pedestrian access and how to provide good connections of buildings to transit service. Further, there are few champions of the idea and a hesitancy to be early adopters of the concept.

Technology assessment

The second step in the innovation process is to conduct a technology assessment. What are the characteristics of the innovation as they relate to its ease of adoption? Important factors are relative advantage, trialability, observability, complexity, cost of implementation, and effects of failure.

In regards to the relative advantage, there is little that is known in any specific way. The potential benefits of transit sensitive land use design to developers, to communities and to the market are largely unknown. While the benefits appear to be intuitive, not much is known in a quantitative sense. Substantial effort is needed to assess the potential impacts of transit sensitive land use patterns on travel demand, on the efficiency of land use and public services and on transit usage. Will transit sensitive land use reduce the need for travel and public services? What are its environmental consequences? What characteristics have market appeal? In order for these concepts to gain wide adoption and implementation answers will be needed for these questions.

A second consideration in technology assessment is trialability. Innovations that can be given a "test drive" or "free home trial" will be adopted quicker than those that require irreversible commitments. Transit sensitive land use design is of the latter type. It is not easy to experiment with such an innovation. This factor makes it more difficult to implement.

The third factor is observability. How easy is it to observe or measure the results of an implementation? In this case transit sensitive land use design could be rated as positive for its performance would be readily apparent if implemented. The market response to projects with

improved transit/pedestrian/bicycle access would provide a direct demonstration of its effects. This means that successful projects could be quickly emulated and applied elsewhere if there was a clear market response to early projects. On the other hand should they fail, it would be difficult to overcome such results on subsequent projects. This leads to an understanding of the importance of quality design and execution on any projects that are attempted.

The next factor is the cost of implementation. Because of the necessary scale of a transit sensitive land use pattern, this factor would have a negative effect on implementation. Transit sensitive land use patterns cannot occur in isolation; they need to be strategically linked together and developed in phases so that a viable pattern results. This is difficult and requires sophisticated planning to make it work. Projects require a critical mass and substantial costs. This along with the lack of trialability are the two major negative factors in the ease of implementation of these concepts.

Table 3 Technology assessment issues

Category		Effect on Implementation of Transit Sensitive Land Use
Relative advantage	What are the benefits of the innovation over current methods to individual users?	unknown
Trialability	How easy is it to experiment with the innovation?	negative
Observability	How easy to observe/measure results?	positive
Complexity	How easy is it to understand?	positive
Cost to implement		negative
Cost of failure		can be positive or negative depending on design

The final factor which affects the ability of an innovation to be implemented is the consequences of failure. What happens if a project does not work as is intended? How adaptable would a project be to change if it was necessary? In this area there is no simple answer since the adaptability of a project would depend on its design. Adaptability can be designed in and projects can be staged over time to minimize the potential for project failure.

Each of the 44 guidelines may have different levels of implementation, different barriers and opportunities.

Overall strategies for implementation

The review of users and the technology suggests several steps that need to be taken to move towards implementation. These are:

1. Increase awareness of transit service design. Developers and local government personnel were found to have very little knowledge of how transit operates, the economics of transit and physical factors in transit route location.
2. Increase awareness of land use design issues. Transit sensitive land use design is a new concept and developers, financial institutions and local government needs to be more aware of what it is and how it works. Outreach programs are needed at a regional level to explain the concept and to increase understanding of how it would work.
3. Conduct benefit studies. Quantitative analyses are needed of the potential benefits, costs and performance of various elements of the design concepts. Serious government agency consideration of transit based development projects will not occur unless there is a clear understanding of how such projects can benefit the community.
4. Conduct market research. Work is needed to better define the market segments that may be attracted to live and work in transit based communities. Their values, needs and characteristics need to be well known in order to provide quality designs. Furthermore, investment commitments to such areas will not be made unless there is a clearly demonstrated market potential.

5. Conduct detailed technology assessments. The previous section provided a general assessment of the overall concept of transit sensitive land use. However, the concept has many elements which have varying degrees of implementation feasibility which should be explored in more detail. They also should be analyzed in further detail to determine which of the elements are essential, which are desirable, and which are marginal. This would help in further implementation analysis.

These guidelines contain many concepts and rules that should be integrated into municipal zoning codes. Some guidelines involve general concepts that require a broad review of the zoning ordinance for improvement, while others necessitate the insertion of a specific regulation. The following summary was developed to assist local planners with the specific suggestions for the implementation of these guidelines in their communities.

Specific strategies

In addition to the general approaches described above there appear to be some specific actions which are critical to the concept. Suggestions of strategies to implement key guidelines are given below (Beimborn et al. 1991).

Modify zoning codes through the designation of Transit Corridor Districts (TCDs)

Zoning codes at the local level should be modified to accommodate the concept of a Transit Corridor District (TCD) as a new zoning district. The TCD would be similar to a Planned Unit Development (PUD) because it incorporates many aspects found in other zoning districts. The TCD should have transit service as a main objective. Mixed use development should be encouraged and projects in the TCD should have to meet all district level guidelines. The idea of a TCD focuses transit service and develops a separation of land uses that relate well to transit from those that relate to the automobile.

Provide for transit-sensitive review of site plans and development proposals

It is important that the needs of transit be considered in the planning review process, since most land development projects are developed with little or no transit input. A transit-based review should be included in the development review process in the same manner that landscaping, aesthetics, and utilities are reviewed by many municipalities. This review should cover all developments, even those outside TCDs. If the municipality has a staff person with training in the transit service field, the review can be done in-house. If present staff does not have background in this area, then the local transit agency should consult in site plan reviews. Transit-related concerns should be given serious consideration for all developments.

Provide a transit checklist for potential developers

A checklist of transit-based requirements could be used not only as an aid for developers, but the local government could adopt it as an official part of the review process. Once a comprehensive, final checklist has been completed in conjunction with the transit agency, a statement such as the following can be added to the zoning code: "All development proposals will be reviewed using the official transit checklist and any other applicable regulations." The checklist could also be informally used as a means by which developers are informed of the issues a municipality will consider when reviewing a proposal. The checklist should be reviewed and updated on a regular basis.

Parking requirements in TCDs should reflect availability of transit services

Parking requirements can be modified in Transit Corridor Districts. Specific parking requirements in a TCD should be covered by provisions for a parking gradient or the provision of different levels of parking based on proximity to transit. Parking requirements in the current zoning ordinance should be reviewed. Most likely, the ordinance has minimum levels of parking that

must be provided and changes should be made to lower the minimum number of spaces required in areas where transit is present. There could be two sets of minimums for land outside of TCDs. Minimum levels of parking for land uses that are not compatible with, or near, transit services should be set to accommodate all patrons as auto travellers.

Predesignate a future system of transit corridors

Regional planning efforts need to consider where major transit services should exist in the future. TCDs and other future main transit routes should be located before development occurs. It is important to take a long range view and to map out where future corridors of transit service will be. TCDs should be zoned as entire districts. It could be feasible to add to a TCD if future growth patterns warrant, but the initial rezoning should include all land necessary for the successful development of a corridor.

Establish transit service zones along existing arterials

TCDs can be designated along existing, developing corridors. Flexibility must be incorporated into the TCD if existing developments are present. If a TCD zone has been established in a partially undeveloped area, it may be necessary to create two districts, TCD-1 and TCD-2, with one zone more permissive of older developments.

Explore public/private opportunities for transit stop joint development

A most opportune location for joint development by the private and public sectors is at transit stops. Local governments should consider a proactive approach to development surrounding stops. Large stops can become part of the surrounding buildings. Developers may pay to construct sheltered stop areas that tie directly to their buildings and revert the actual right-of-way to the municipality. The main benefit for the developer is the increased patronage that will flow from the transit stop directly into the building. For the municipality, capital costs are reduced.

At smaller stops, simple retail services can become part of joint development efforts. The presence of retail services at transit stops can be contracted out to businesses for different services. This also allows small businesses to become established in each neighborhood. Another alternative is to seek joint development opportunities with private companies. In return for providing some of the needed funds to develop the transit stop, a private firm is allowed to use the adjacent land for retail service provision.

Design for a phased implementation of transit corridors

The designation and official zoning of a Transit Corridor District (TCD) is the first step toward implementing transit service. The municipality should develop standards by which the corridors' growth will be measured. After growth in population and building has occurred, additional service should be added. The additional service should include the improvement and expansion of transit stop facilities. The municipality should develop a schedule, based on the amount of development, showing when upgrades will be made to services and stops.

Control of through automobile traffic

Successful TCDs could generate large amounts of automobile traffic and will interfere with the ability to provide high quality transit service. It would be very difficult to close an existing roadway after substantial development has occurred. Early location of no-auto zones along the transit route before development is critical and will limit automobile interference. These can be protected through official mapping and/or the zoning map.

Use transit corridors for primary pedestrian, bicycle and transit movement

The zoning code and site review process should be modified to assure that there is a provision for separate, high quality, pathways for pedestrians and bicycles. All cul-de-sacs should include pathways at their ends to connect to surrounding streets. Logical pathways should be provided to provide direct connections for between different parts of developments. Sufficient rights-of-way should be reserved (through official mapping) to permit separate, parallel bike and pedestrian paths along transit corridors and arterials within transit service zones.

Provide mixed land use including housing, office, retail, light industrial and recreational uses

This guideline would be implemented by developing special zoning categories at transit stops. Larger projects would be encouraged that contained a ratio of uses (for example, a ratio of office space to residential units, with flexibility. Single parcel, mixed use developments provide better interaction between different land uses than separate, adjacent parcels with different land uses. Another option would be to zone on a small parcel level to ensure a variety of compatible uses adjacent to one another.

Relate the design and connections of adjacent developments across 'seams'

The ability to tie together individual development projects is critical to the uccess of a Transit Corridor District. Developers should be allowed considerable flexibility in their planning within a project; however, project review and stipulations must assure that adjacent developments fit together. Conditions that should be met include maintenance of the continuity of transit roadways, circulation between adjacent properties, provision of easements on rights-of-way for pathways and appropriate adjacencies of land use.

Develop a program to encourage shared parking facilities

To encourage the use of shared parking lots, the municipality should require each proposed project to identify all parking facilities on adjacent parcels and explore the feasibility of their use as shared lots. Local government also could approve development proposals on the condition that the land owner sign an agreement stating that they will arrange for joint use of parking facilities whenever deemed feasible by the municipality.

Minimize the distance between building entrances and transit stops, provide logical connections between buildings and transit

A basic tenet that should be implemented in the zoning/building code is that pathways should be provided between transit stops and building entrances. This is seldom done in suburban areas; often it is necessary for a user to walk across lawns or through parking lots to reach a building. This regulation also would specify a maximum walking distance from transit stops to building entrances.

Building location and design should be sensitive to transit-generated noise and views

This guideline can be easily adapted to a zoning code. Either the municipality can maintain a very large right-of-way along the transit path, or building setback requirements can be regulated to keep residents removed from the sight and noise. Setbacks should be greater near transit stops for residential buildings where vehicle acceleration and braking noise is loudest. Commercial buildings can be permitted to be closer to the transit line than residential uses. In addition to the increased setback distances, trees and berms can be used to block the view of the transitway. Local government should have a policy of maintaining tree plantings along the transit rights-of-way.

Plan for a high quality pedestrian/bicycle pathway system

As part of the TCD, a pathway system of public rights-of-way should be developed within its boundaries. This system should be mapped out and be designed with area-wide connectivity. Private developments also should become part of this system. The municipality would require each developer to submit a pedestrian/bicycle pathway plan. The plan should show how pedestrians and bicycles will be able to cross the property and how the pathways will connect into the overall pathway system. All cul-de-sacs should have pathways that lead from their ends to adjacent streets. The municipality should maintain an updated pathway system map.

Provide for feeder bus and auto access points

This guideline requires some type of transit station or parking area to be used by the transit service. Feeder bus service should be at a major stop along the transit corridor. On the other hand, the park and ride facilities should be located away from the larger, dense stops. If feasible, park and ride lots may utilize some type of shared parking facility. Developments with large parking areas should be required to include sufficient space for bus movements in case future park and ride or feeder service becomes practical on the site.

CONCLUSIONS

This paper has explored some of the issues that are involved in the implementation of transit sensitive land use design. A technology transfer planning process was used to describe characteristics of potential users of the concept and to identify characteristics of the innovation that affect its likelihood of implementation. User groups include developers, local government personnel, and people seeking new places to live and work. Developers are likely to be most open to the innovation while local government is less likely to be receptive. Strategies are needed to increase awareness of transit service needs, land use design concepts, potential benefits of transit sensitive design and market characteristics of potential residents of such areas. Specific strategies for implementation would include development of transit corridor district overlay zoning, review of projects from a transit and pedestrian/bicycle viewpoints, predesignation of transit corridors, control of automobile traffic, and modification of parking and land use density, building setback and site design requirements.

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