# Can IT industry regenerate mill towns? Holyoke's revitalization through land-use and urban design

**İpek Kaynar Rohloff, PhD**[1]

Mount Holyoke College, South Hadley, MA, USA

ABSTRACT: Mill towns of New England have been under distress for several decades due economic decline and depression in small manufacturing industry. These economic challenges contribute to the decaying urban environment and impoverishment of the communities. Information technology (IT) intensive industry has been touted as a panacea that can revitalize declined post-industrial economies. However, revitalization of a historic mill town with IT intensive industry may present unforeseen challenges and limitations to sustain the prosperity of local communities and vibrancy of urban environment. This paper analyzes to what extent the fostering of IT intensive industry in historic mill towns facilitates sustainable revitalization and aid the regeneration of the communities. This analysis focuses on recent developments in Holyoke, MA along with a brief review of economic redevelopment in Maynard, MA in the past based on high-tech industry. Holyoke is engaged in a major revitalization process catalyzed by the recent opening of a high performance computing center and subsequent development of the innovation district. We examine these revitalization efforts through the lens of smart growth strategies focusing on sustainability of the local urban environment. The investigation identifies urban morphology changes that are needed to create a synergy with the implementation of the IT intensive industry for the creation of vibrant nodes withy mixed land-uses and a cohesive community.

KEYWORDS: Urban morphology, mixed uses, IT-innovation districts, local communities, economic development

## INTRODUCTION

For past several decades, economic decline and depression in small manufacturing industry have been the source of decaying and deteriorating urban environment and impoverishment of the communities in the mill towns of New England. As these poor conditions create a burden for regional economies, strong revitalization plans became crucial for the declining mill towns to regain a competitive edge in regional economies and improve the tax base. Economic redevelopment is considered the most critical step towards revitalization of the historic mill towns, therefore the local governments concentrate their efforts on attracting new industries that can contribute to job creation and economic redevelopment. Recently, fostering information (IT) intensive industry has been one of the leading approaches to attempt economic redevelopment in declined industrial cities. IT intensive industry has gained publicity as a potential catalyst for revitalization, most probably due to the lucrative economic returns and social prestige of IT business. In addition, IT intensive facilities are often considered appropriate for being hosted in retrofitted mill buildings; existing mill town infrastructure is economically efficient with competitively lower property values which benefits IT companies at the start-up stage. However, reliance on the promises of the IT intensive industry for revitalization presents some problems. This is mostly because the IT industry may have a limited effect on bringing economic and social diversity transforming the local community and other urban form to support the economic regeneration.

This paper explores opportunities and challenges presented in mill town morphologies for revitalization through IT intensive industry. IT based economic redevelopment alone may bring only limited benefits to local communities as compared to the transformation needed for a revitalization within the physical environment changes intrinsic to economic and social development. For a sustainable revitalization, economic redevelopment should be supported by social capital and economic diversity, along with physical environment changes to facilitate diversity of social groups and uses. In comprehensive urbanism studies, revitalization process is considered a "place-based people strategy" which involves "improving the lives of residents within a designated area through investment incentives, local hiring clauses, empowerment zones, some beautification projects and similar policy tools" (Sutton 2008). As can be implied in this definition, physical environment is in fact an integral part of revitalization. The role of physical environment for revitalization can be further understood with analysis of urban morphology and its properties intrinsic to human spatial activity that concerns economic and social transactions.

With a motivation to inform revitalization through morphology and land-use changes, this paper investigates the following:

(1) What challenges does the current morphology of mill towns present for revitalization?
(2) To what extent can IT intensive facilities regenerate the local urban environment?

(3) What kinds of changes in urban environment can contribute to connecting new land-uses with the existing neighborhoods?

These questions are explored in the case of Holyoke, Massachusetts which provides an interesting example with its rigid morphology and recently formulated revitalization plans based on innovation economy. Although our analysis mainly focuses on Holyoke, we also discuss another mill town, Maynard, which went through a number of redevelopment cycles extensively driven by high tech industry. In the case of Holyoke, this paper examines the implementation of an IT intensive facility and plans for the innovation district in the framework of smart growth principles that can transform the existing morphology.

## 1.0 URBANISM WITH SMART GROWTH STRATEGIES FOR DECLINED CITIES

Urban revitalization projects for declined cities have been informed by smart growth strategies that promote compact built environment with mixed uses, housing choices, walkability and transit oriented development. These principles promote shaping of urban environment to facilitate social and economic transactions and community connectedness, and thus bring environmental, social and economic benefits (Yang 2008; Downs 2005).

Smart growth principles were derived from urbanism theories and criticism to the Modernist large scale and top-down planning decisions and divisive zoning rules that have been formulated since the 1960s. As explored by several urbanism theorists, certain spatial elements of urban environment can promote diversity of people, functions and land uses and contribute to economic vitality and social cohesion (Alexander 1965; Gehl 1987; Hillier 2009; Jacobs 1961; Newman 1972; Whyte 1980). Jacobs (1961) advocates for smaller building blocks as they create frequent intersection of streets and thus facilitate chance interactions and subsequent development of economic activity. Alexander and Gehl point to programmatic conditions such as overlap of the occupied areas of different facilities and optional activities, which create the mixed uses in natural patterns of people (Alexander 1965; Gehl 1987). With a greater emphasis on morphology, Schumacher (1978) elaborates that urban space can maintain density of movement if a sense of closure is defined by building blocks and if streets are continuously connected like in “network-like” structure instead of being segregated away from major arteries (“tree-like”) like in cul-de-sacs (Schumacher 1978).

Consistent with the insights of Schumaher (1978) and Jacobs (1961), space syntax theory suggests that streets segments that are reachable from all other segments by involving the fewest number of other streets attract movement (Hillier et al. 1993). Therefore, streets with greater number of intersections are more likely travelled by people, and streets that can be reached by traveling through only few others are places of social encounter, co-presence and commerce. Space syntax framework claims that land-uses such as retail, commerce, passing trade, are in fact economic entities also migrate to hierarchically important destination or through-fare places. In return, these economic entities such as shopping centers operate as attractors of movement. Therefore, people’s spatial activity are predicted within the synergy created between street networks and programmatic attractors (Hillier 2005). Resonating with Jacobs (1961) Peponis et al (2008) explore that the denser the street network, the greater chance that people deviate from routine movement and explore unfamiliar places and convenient shopping (Peponis, Bafna, and Zhang 2008). Hillier furthered this argument by suggesting that higher density of streets and frequent intersections form economic centers in large metropolitan areas. Hillier argues that the street networks that form economic centers are distinguished from streets for residential areas which may have a more homogenous segment structure (Hillier 2009).

## 2.0 CHALLENGES AND OPPORTUNITIES IN THE MORPHOLOGY OF MILL TOWNS

Within rigid morphological characteristics, historic mill towns present some challenges along with some opportunities for revitalization. The proposition that hierarchical relationships of street network predict concentration and passing behavior of people and thus associated economic and social transactions can be true only to a limited extent in declined mill towns. Despite intact street layouts and even a compact build environment, the towns lack various land uses and strong economic structure, to help generate human spatial activity. Without these elements, the streets of these mill towns are like an infrastructure without any substantial purpose. Revitalization efforts aim to provide economically regenerative and socially vibrant public realm. An essential factor transforming “place” is the implementation of new market sectors in the built fabric of mill towns. This implementation should not focus on a single market sector; however, the economic redevelopment should generate social and economic diversity and make a regenerative effect on local communities. New market sectors should ideally motivate other sectors in the local site, with demands for housing, retail and other commerce. New market sectors thus should be able to motivate the growth of new economic centers in time, along with planning and construction of the physical environment. However, sectors that are alien to the local community, such as shopping malls and casinos may have a detrimental effect on community and alter traffic patterns drastically and in undesirable ways.

Information technology has been considered as a potential source for economic redevelopment in declining cities (Harris 2013; Gospodini 2006). Old industrial cities with intact physical infrastructure and tax incentives

provide attractive sites for information technology start-up companies. However, it still is an open question whether information technology businesses could have a regenerative effect on declined mill towns and their communities. Given the specific skill base used in IT firms, economic development through IT intensive industry may also alienate the mill town communities and thus present challenges and limitations for revitalization. This is because IT facilities today extensively utilize virtual operations with high skilled labor not present in local communities, thus can be less generative of new land uses in local environment, as portrayed by technology theorists and sociologists (Castells 1991, 2000, 2000; Gibson 1984; Mitchell 1995, 1999; Sassen 2007) Recent developments show that in IT operations does not entirely diminish the physical dimension of interactions (Gospodini, 2006); on the contrary IT may induce new kinds of relationships with urban land and new spatial activity and travel patterns (Wheeler, Aoyama, and Warf 2000).

In the wake of attracting new industries to declined cities, urban form will have to support multiple market sectors and create diverse social and commercial transactions in order the economic regeneration to be sustained. The urban form adaptability is partially defined by the pattern of property ownership that determines how the land is divided into individual parcels. Scheer (2010) points out that as cities grow and change in response to economic, political and cultural conditions, the urban block parcel, so-called “tissue,” remains relatively constant (Scheer 2010). She argues that a fine grained tissue with small parcels and multiple owners in the urban blocks create challenges for adaptability as each building will change individually and different times, the overall structure and character of the place remain the same because a small parcel framework dictates certain types of buildings (Scheer 2010; Campoli 2012). Depending on the physical and fiscal conditions of the declined town the urban block and tissue define both challenges and opportunities for adaptability to new and multiple industry sectors and housing choices, As discussed by Campoli, vacant land in former industrial sites offers larger footprints for new industries, while intact remaining mill buildings may open up the entire block only for single use and diminish the diversity of street (Campoli 2012).

## 3.0 MAYNARD (MA) AND ECONONOMIC DEVELOPMENT THROUGH HIGH TECH INDUSTRY

Challenges in revitalization processes have been pertinent to many declining mill towns. A number of mill towns provide provide additional context for our more in-depth analysis of Holyoke and its recent IT intensive industry development. the New England mill towns have been attempted to be revitalized through a wide array of approaches including museums, shopping centers, artist lofts, theatres and software companies as well as housing driven by local and regional assets (Mullin and Kotval 2009).. In Massachusetts, the economic development of mill towns has been influenced by the high tech industry along the major traffic arteries outside the city of Boston. For example, the development of high-tech industry on the Rte.128 corridor has been motivated by research institutions like Massachusetts Institute of Technology, local private equity and the defense industry, which were all established in Boston as a result of the historic financial and economic legacy of nearby mill towns.

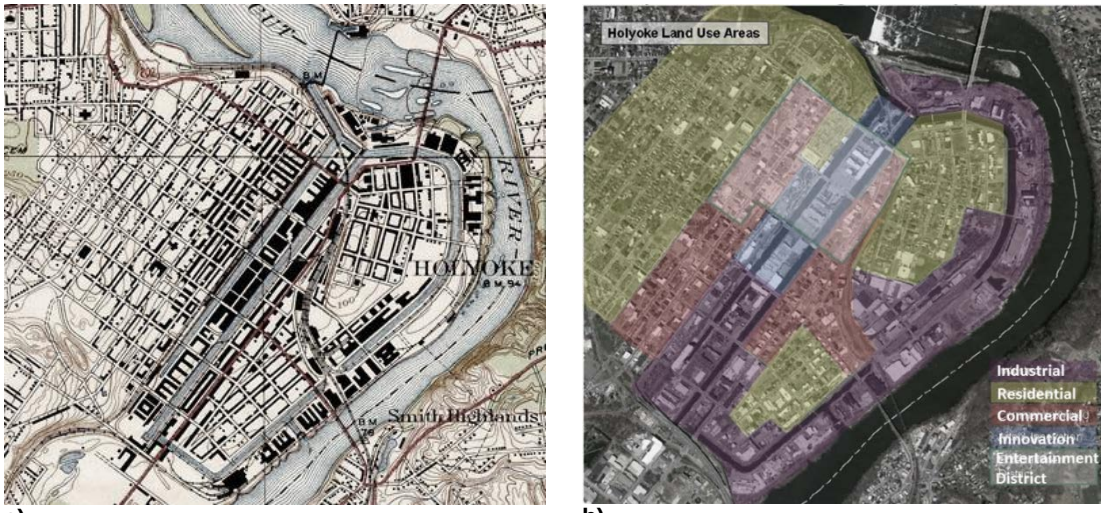
One mill town that was influenced by the high tech industry in the region was Maynard, MA, originally established as a wool manufacturing community on the Assabet River. In Maynard, the wool manufacturing mill was major employer of the town community. Following the gradual decline of the mill by 1950; the mill building housed temporarily a number of industrial firms, which were attracted by cheap available space, trainable labor and proximity to Greater Boston. The major economic redevelopment took place once the Digital Equipment Corporation (DEC) was settled in the Maynard mill. DEC later became the largest producer of mini-computers in the world which was, for a time, the primary industry of the town (Mullin, Armstrong, and Kavanagh 1986). The corporation employed not only the worker community of Maynard, but also became a major anchor of the regional IT community, providing some of the critical equipment for the early Internet and computer revolution. Although DEC’s presence as an expanding high tech firm was a positive occurrence for Maynard’s employment needs, it was not transformative for the urban environment; DEC used only the single, self-contained large mill complex in town. Further, the reliance of the town on a single large industrial corporation did not bring a resilient transformation. After the 1980s, DEC’s operations started to decline due to the market shift in the high tech industry towards home based personal computers, and the decline in the use of minicomputers produced by DEC. The corporation bankrupted and left Maynard in 1990s leaving a large trained worker community which could be employed by other high tech firms in the region (Mullin, Kotval, and Karamchandani 2008), but not in Maynard. DEC’s transformative effect on the town physical environment remained limited with the adaptive reuse of the mill building, yet DEC transformed the social capital of the town (for a time) and has had a long-lasting impact on the regional economy .

## 4.0 HOLYOKE (MA): REVITALIZATION THROUGH INNOVATION ECONOMY

### 4.1. Morphology, Current Land-uses and the Revitalization Efforts

Holyoke, established in 1830s as a paper manufacturing community on the Connecticut river, presents an interesting example to explore how urban morphology could work in concert with new economic development based on IT intensive industry and subsequent land-uses (Fig. 1a). Current land uses in Holyoke include limited retail, small manufacturing, and residential buildings. Blighted areas, empty lots and

abandoned buildings highlight urban distress. Recent revitalization efforts in Holyoke focus on economic development through innovation industry and urban renewal through adaptive reuse of historic mill buildings, restoration and beautification of main streets and canals for broader community use. A key move within these efforts is recent implementation of the Massachusetts Green High Performance Computing Center (MGHPCC), which is planned to serve as a data processing node for five major universities in the state. The high performance computing center is considered by the local planning authority as an attractor for innovative and creative start-up companies which will form an innovation district.




**a)** **b)**

**Figure 1**. **a)** Map of Holyoke Canal System (Holyoke, Massachusetts, USA), c.1938,
**b)** New land-uses planned for Holyoke today; the area marked as "Entertainment District" is a planned for smart growth rezoning. Source: City of Holyoke

Despite its potential as a cutting edge IT based research facility, the computing center provides a limited capacity for new employment with only 16 positions for non-skilled labor, thus the facility can hardly be seen as a major economic development with job creation capacity. A more profound economic impact on Holyoke's community can only be experienced in occurrence that the computing center attracts other information technology intensive business to the area. At this point there is only limited information on how many new companies may start business in the area. It is yet to unfold whether new IT companies will induce a new social capital, improve the employment basis from the local community and increase the population density and spatial activity that can motivate housing, retail and service sectors. Indeed, along with the high performance computing center, the innovation district is critical for the revitalization due to being a part of the area designated for "smart growth" based on rezoning to allow for mixed use development with a combination affordable housing retail and office development in close proximity (Mass.Gov 2013) (Fig. 1b). The innovation district is envisioned to seed developments for a new economic node in Holyoke downtown with mixed uses residential, retail, and commerce as well as walkability potential, vibrant public realm and a diverse community. However, this capacity may be synergized by necessary changes in urban morphology to support connectivity for walkability, social and economic transactions and to allow diverse building types and uses.

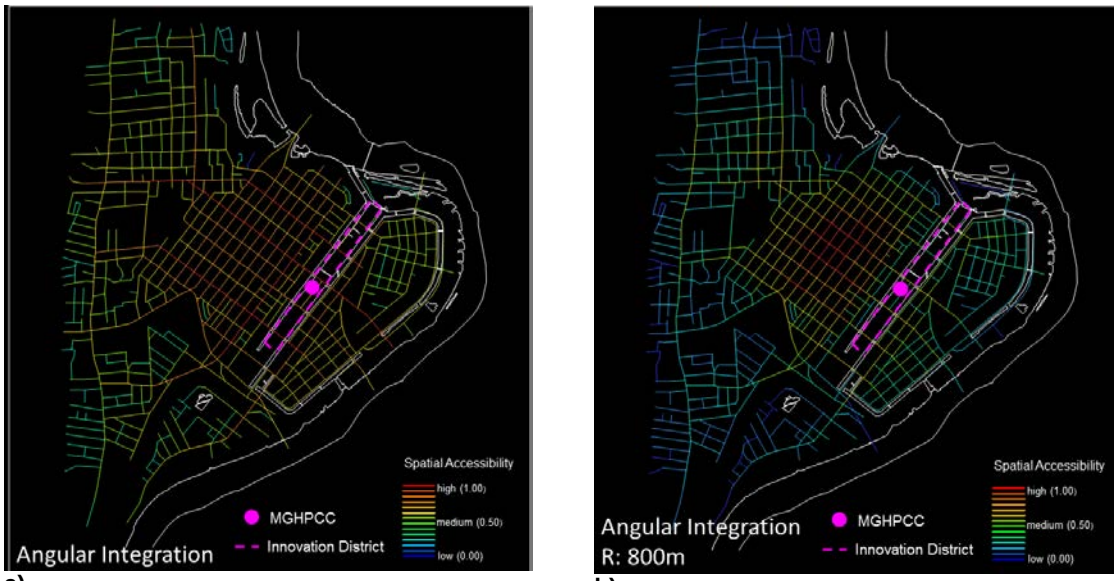
## 4.2. Capacity of Innovation District for Smart Growth within the Morphology

A preliminary analysis of Holyoke downtown reveals opportunities and limitations provided by the existing morphology. Holyoke downtown is shaped by an urban grid of 450x250ft (140x80m) blocks, interlaced with power canals and delineated by the river. The urban block is characterized by mill buildings in large parcels and row-house enclaves for workers, single family houses in smaller parcels, and a few town parks. The mill buildings arrayed along the power canals and the riverfront provide limited penetration for visibility within the block. Street network continuity is partially interrupted by canals along the central arteries of the town. Our further analysis is based on street segment analysis and an examination of urban block and tissue properties. Street segment analysis explores hierarchical relations that may modulate people's movement towards certain areas and create potential for social encounters and economic development. The urban block and tissue properties in downtown including blighted areas reveals opportunities and limitations for morphological changes such as urban block modifications and new building types.

### Movement and Concentrations in Street Network

In street segment analysis (of space syntax), "angular integration" measure captures the likelihood that segments are likely destination points due to being reached within the least number of turns and minimum

sum of angular change in street network. Streets with high degree of “angular integration” are where human flow is attracted to and thus present potential for frequent social encounters thus a good value for locating commerce and other business activity. To explore this capacity for general movement and pedestrian access, we ran the analysis for all street connections and the connections within the 800m diameter from each street. The 800m diameter corresponds to 10 minute walking distance for pedestrians.




**a)** **b)**

**Figure 2.** Angular Integration graph of Holyoke **a)** For all street connections, **b)** For connections within 800m diameter from each street. Source: Analysis by author using the map provided by the City of Holyoke.

The angular integration graph run for all street connections indicates that the major street running parallel to the central canals on their west side is the most likely destination in downtown Holyoke (Fig.2). This street in fact is currently the major avenue (High Street) where small street shops, restaurants, the city hall and other public buildings are located. The other segments with high degrees of angular integration are those running perpendicular to the canals, which connect the downtown to the west. However, not all of these east-west arteries present this capacity because of interruptions in their continuity by the canals. Indeed the street network in general would benefit from further densification by the canals area in order to gain greater capacity to attracting people’s movement towards the central core. Currently urban blocks around the central canals are quite large determined by the size of historic mill buildings. The angular integration graph based on connections in 800m diameter (Fig.2b) shows that the potential destination points for pedestrians are at west side of the downtown where street network forms a homogeneous and regular grid. This capacity of the current street layout predicts pedestrian walkability, which would be an asset for mixed uses in smart zone areas. However, the planned smart zone area falls in the north side of that highly integrated core shown in Fig.2b. In order to work in concert with densification of land-uses in the overlay district, street layout should facilitate movement towards this area through more frequent intersections.

This analysis suggests that the existing street layout of Holyoke is almost too homogenous to motivate vibrant economic sub-centers; there is very little differentiation in the grid to yield new nodes. In particular, the street layout around the high computing center and the Innovation district area is even more segregated from the entire downtown due to the interruptions by the canals and large mill buildings.

**Urban Block, Tissue and Building Types**

The street network analysis provides more meaningful insights when examined together with urban block, building footprints and property division characteristics. As can be seen in Figure 3, Holyoke downtown morphology is characterized by almost homogenous urban grid and building types as large mill complexes, row-houses and single family houses. As suggested by properties selected for clearance and rehabilitation. The large mill complexes along the canals and riverfront present capacities for adaptive reuse or new construction. New constructions in the sites of large building footprints areas provide opportunities to implement mixed use buildings within new typologies. A number of other rehabilitation properties are within the smart growth zone. In particular, three rehabilitation property groups are aligned along the artery perpendicular to the canals, which is found to be an integrated in the street segment analysis. These observations suggest the smart growth zone have the potential for further change with new building types and urban renewal of the primary arteries. Despite the rigidity of the urban grid, new building blocks and types may foster mixed-uses and various housing choices. Rehabilitation of the mill sites with smaller

building footprints may improve the connections of the mixed used neighborhoods with the proposed canal walk. This connection can attract greater number of people to the scenic canals and thus help build vibrancy around the innovation district (Fig. 4).


**Figure 3**. Proposed rehabilitation areas and smart growth district within the urban block and tissue properties. Source: Analysis by author using information and map provided by the City of Holyoke.

**Figure 4.** The Canal walk after the recent rehabilitation (left) and its future projection (right). Source: City of Holyoke

## 5.0. CONCLUSIONS

This paper provides preliminary analysis of Holyoke in the light of Maynard economic redevelopment history. In contrast to Maynard case depending on substantial worker base, the IT intensive facility implemented in Holyoke promises very limited impact on local community in its current state. Holyoke's innovation district planned jointly with the high performance computing center may be regenerative if synergized by physical environment changes guided by smart growth. The changes in physical environment, that foster mixed uses, new building types and better connectivity can accommodate and facilitate new land uses and spatial activity fueled by the innovation district. The current morphology of Holyoke is not conducive for creating economic sub-centers around the high performance computing center and the innovation district due to the street layout that remains too homogenous and strict due to the effect of legacy mill buildings and the power canal system. Our examination of urban block, building types and tissue properties suggest greater potential for essential morphological changes. In central areas, large building footprints may redeveloped in smaller parts

in order to create diversity with street and the planned canal-walk. In order to break the rigidity of the street network, areas of large building footprints may even be planned with additional streets to promote chance interactions. Blighted areas that are open for rehabilitations could introduce new building typed that foster mixed uses.

Motivated by a provocative example like the high computing center and the innovation district developments in Holyoke, our analysis and findings are preliminary. As more information on new IT facilities becomes available, our investigation can be furthered with more detailed comparisons of the potential land-uses and the morphology.

**REFERENCES**


Alexander, Christopher. 1965. The city is not a tree. *Architectural Forum* 122 (April and May).

Campoli, Julie. 2012. *Made for Walking: Density and Neighborhood Form*. Cambridge, Mass.: Lincoln Institute of Land Policy.

Castells, Manuel. 1991. *The Informational City: Information Technology, Economic Restructuring, and the Urban-Regional Process*. Oxford: Blackwell.

Castells, Manuel. 2000. The Architecture of the End of History. In *The Rise of the Network Society*. Oxford: Blackwell.

Castells, Manuel. 2000. The Space of Flows. In *The Rise of the Network Society*. Oxford: Blackwell.

Downs, Anthony. 2005. Smart Growth: Why We Discuss It More than We Do It. *Journal of the American Planning Association* 71 (4):367-380.

Gehl, Jan. 1987. *Life between buildings: using public space*. New York: Van Nostrand Reinhold.

Gibson, William. 1984. *Neuromancer*. New York: Ace.

Gospodini, Aspa. 2006. Portraying, classifying and understanding the emerging landscapes in the post-industrial city. *Cities* 23 (5).

Harris, Paul. 2013. Detroit: after decades of urban blight, technology boom gives Motor City hope. *The Guardian*, http://www.guardian.co.uk/world/2013/jan/12/detroit-technology-fresh-hope.

Hillier, Bill. 2005. The Art of Place and the Science of Space. *World Architecture* 11/2005 (Special Issue on Space Syntax):24-34.

Hillier, Bill. 2009. Spatial Sustainability in Cities: Organic Patterns and Sustainable Forms. Paper read at 7th International Space Syntax Symposium, at Stockholm.

Hillier, Bill, Alan Penn, Jullienne Hanson, Tadeusz Grajewski, and J. Xu. 1993. Natural movement: or, configuration and attraction in urban pedestrian movement. *Environment and Planning B: Planning and Design* 20:29-66.

Jacobs, Jane. 1961. *The Death and Life of Great American Cities*. New York: Random House.

Mass.Gov. *Housing and Economic Development, Chapter 40 R Program Description*. Mass.gov 2013 [cited 19 Jan. 2013. Available from http://www.mass.gov/hed/community/planning/chapter-40-r.html.

Mitchell, William J. 1995. *City of Bits: Space, Place and the Infobahn*. Cambridge: MIT Press.

Mitchell, William J. 1999. *E-topia: Urban Life, Jim - But Not As We Know It*. Cambridge: MIT Press.

Mullin, John , and Zenia Kotval. 2009. The Revitalization of New England's Small Town Mills: Breathing New Life into Old Places. *Local Economy* 24 (2):151-157.

Mullin, John , Zenia Kotval, and Zeenat Karamchandani. 2008. Partnerships and the Fiscal Implications of Planning and Development: A Case Study of Maynard, Massachusetts. *Planning Practice and Research* 23 (4):461-478.

Mullin, John R., Jeanne H. Armstrong, and Jean S. Kavanagh. 1986. From Mill Town to Mill Town: The Transition of a New England Town from a Textile to a High-Technology Economy. *Journal of the American Planning Association* 52 (1):47-59.

Newman, Oscar. 1972. *Defensible Space; Crime Prevention through Urban Design*. New York: Macmillan.

Peponis, John, Sonit Bafna, and Zongyu Zhang. 2008. The connectivity of streets: reach and directional distance. *Environment and Planning B: Planning and Design* 35:881-901.

Sassen, Saskia. 2007. Dis-assembling the urban: The variable interactions of spatial form. In *Writing Urbanism*, edited by D. Kelbaugh and K. K. McCullough. New York: Routledge. Original edition, 2008.

Scheer, Brenda C. 2010. *The Evolution of Urban Form: Typology for planners and architects*. Chicago: American Planning Association.

Schumacher, T. 1978. Buildings and streets, notes on configurations and use. In *On Streets*, edited by S. Anderson. Cambridge, Mass.: The MIT Press.

Sutton, Stacey A. 2008. Urban Revitalization in the United States: Policies and Practices. In *United States Urban Revitalization Research Project (USURRP)*. New York: Columbia University.

Wheeler, James O., Yuko Aoyama, and Barney Warf, eds. 2000. *Cities in the telecommunications age: the fracturing of geographies*. New York: Routledge.

Whyte, William H. 1980. *The Social Life of Small Urban Spaces*. New York: Project for Public Spaces Inc.

Yang, Yizhao. 2008. A Tale of Two Cities. *Journal of the American Planning Association* 74 (307-323).