Spaces of Innovation: 21st Century Technopoles

by

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ABSTRACT

Thesis Supervisor: Dennis Frenchman
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Public authorities and private developers around the world are attempting to create and sustain hubs within the innovation-based economy by fostering successful urban environments. These large-scale developments succeed an earlier generation of post-industrial "technopoles" named after the French word popularized by Castells and Hall in *Technopoles of the World* (1994). In the 1990s, most planned technopoles resembled suburban office environments with generous landscaping, wide roads, and automobile-focused circulation systems. In contrast, today's economic development experts are increasingly emphasizing the need for interaction and cross-fertilization among companies and institutions in an attempt to foster innovation, from which successful communities are assumed to derive their competitive edge in an information-based economy. Parallel shifts in live-work patterns among creative talent groups are being documented in social science and anecdotal observations. These trends have heightened competition for qualified individuals and initiated a talent war among cities globally. And these individuals are living footloose lifestyles supported by mobile devices and wireless connectivity. Entrepreneurial public agencies and private developers have recognized the potential for reconceiving live-work environments as economic hubs. These holistic projects are identified as 21st century technopoles because they directly address and capitalize on the socio-economic shifts described above leading to vastly different ideal urban configurations. The thesis asks how urban form is expected to contribute to innovation; and, how urban form is being reconceptualized in turn at the neighborhood scale.

Four case studies provide a rich narrative that begins to sketch the range of proposed urban developments: Cyberjaya, Kuala Lumpur, Malaysia; Digital Media City, Seoul, Korea; one-north, Singapore; Lower Manhattan, New York. A narrative ties the four cases together providing "thick descriptions" as a base-line study for a new mode of technopole development. The analysis reaches from (1) "hardware" or the urban built environment and (2) "wiring" or the embedded and supported technologies to (3) "software" or the actors involved.

The case studies indicate several emergent themes that are rescripting our urban environments. Dense urban zones with a high level of sensory diversity are being proposed for emerging technopoles that capitalize on the city as a metaphor for human interaction and exchange. Real estate value in this system is measured by the number of serendipitous encounters it facilitates. The dichotomous relationship between spaces of places and spaces of flows set forth by Castells seems inapplicable within the boundaries of these zones that are at once core and periphery, local and global. Finally, these developments are living laboratories for the technologies that support new live-work preferences and shifting lifestyles.

Several contradictions become apparent in delving more deeply into the examples, which are still under development. In the promotional materials, diversity – demographic and physical – is embraced, but it is not clear how it will contribute to innovation. More generally, the projects plan for often unpredictable "knowledge accidents." The radical break with past initiatives nevertheless reinforces entrenched infrastructural and social structures already in place within the urban system. Practitioners face these contradictions on the ground and address them as they move forward with provocative projects that should be tracked in the upcoming years.

table of contents

Abstract	3
Table of Contents	5
Acknowledgments	7
List of Illustrations	9
Prologue	13
Introduction	15
Chapter 1: Revisiting Technopoles of the World	23
Chapter 2: Introducing the Case Studies	39
Chapter 3: Discussing the Plans: "Hardware"	61
Chapter 4: Understanding the Use of Technology: "Wiring"	79
Chapter 5: Attracting Talent: "Software"	91
Chapter 6: Findings, Results, Scenarios	103
Conclusion: Technopolitan Dreaming	117
Bibliography	121

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Postscript: I would like to acknowledge the city of Cannes where the technopole story began for me!

list of illustrations

Introduction

Fig. 0.1 "How to build a technopole?" See Table included in "How to build a technopole," *The Futurist* 29, no. 1 (January-February 1995): 59. 20

Chapter 1

Fig. 1.1 Blandburg versus Hipsterville, Illustration from newspaper article. See Christopher Shea, "The Road to Riches?" *Boston Globe,* 29 February 2004: D1. 31

Chapter 2

Fig. 2.1 Map of Malaysia and zoom on location of Cyberjaya. See Marc Boey, "(Trans)national Realities and Imaginations: The Business and Politics of Malaysia's Multimedia Super Corridor," Ch. 8 in *Critical Reflections on Cities in Southeast Asia* (Singapore: Times Academic Press, 2002): Figure 8.1. 42

Fig. 2.2 Cyberjaya Flagship Zone. See Federal Department of Town and Country Planning Peninsular Malaysia, *Physical Planning Guidelines for the Multimedia Super Corridor* (September 2000): Figure B2.4.1. 43

Fig. 2.3 Cover of *Physical Planning Guidelines for the Multimedia Super Corridor* developed by the Federal Department of Town and Country Planning Peninsular Malaysia, (September 2000). 43

Fig. 2.4 Cyberjaya Visitors Map exhibited at Setia Haruman Offices in Cyberjaya, Malaysia. Photograph by author March 2004. 44

Fig. 2.5 Aerial view of Seoul showing the location of Digital Media City. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003). 46

Fig. 2.6 Digital Media City masterplan. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003). 48

Fig. 2.7 Location of one-north in Singapore. Provided by JTC in Summary Presentation, 5th Advisory Panel Meeting (December 2003). 50

Fig. 2.8 one-north predominant land uses January 2004. Provided by JTC Corporation, March 2004. 52

Fig. 2.9 Map of Lower Manhattan. Downtown Alliance publication. http:// www.downtownny.com/gettingaround_map.asp 54

Chapter 3

Fig. 3.1 Typical Black and White houses and apartment blocks located on the future site of one-north. Photograph by the author March 2004. 62

Fig. 3.2 DMC concept sketches collected during a design charrette in December 2001. From Seoul Digital Media City Project, School of Architecture and Planning, MIT (May 2002). 66

Fig. 3.3 Main intersection in CFZ, view of new construction for expansion of Multimedia Development Corporation (MDC) operations. Photograph by the author March 2004. 67

Fig. 3.4 View towards Century Square. Photograph by the author March 2004. 67

Fig. 3.5 Biopolis from Wessex. Photograph by the author March 2004. 68

Fig. 3.6 Image of Biopolis under construction. Photograph by the author March 2004. 69

Fig. 3.7 Cyberjaya pocket parks. Photograph by the author March 2004. 70

Fig. 3.8 Green space at the center of Century Square. Photograph by the author March 2004. 71

Fig. 3.9 Central plaza at Biopolis. Photograph by the author March 2004. 71

Fig. 3.10 Typical pocket parks dot the landscape of Biopolis, one of three planned hubs in the planning or construction phase. Photograph by the author March 2004. 72

Fig. 3.11 Grassland area in Wessex Estate. Photograph by the author March 2004. 72

Fig. 3.12 Open Space Plan for one-north. JTC Brochure. 73

Fig. 3.13 Building façades on first phase of Biopolis. Photograph by the author March 2004. 74

Fig. 3.14 DMC Aerial Rendering. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003). 74

Fig. 3.15 Phasing plan for one-north. From JTC, "The Future is Imagination," Informational brochure for one-north. 76

Chapter 4

Fig. 4.1 Downtown Alliance WiFi flier. Downtown Alliance (Spring 2003), www.downtownny.com/wireless. 80

Fig. 4.2 Access point in window of Ulysses restaurant on Stone Street in Lower Manhattan, which was recently renovated thanks to the initiative of business leaders in the area. Photograph by author April 2004. 81

Fig. 4.3 Stone Street in Lower Manhattan. Photograph by author April 2004. 82

Fig. 4.4 DMC Streetlight. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003). 83

Fig. 4.5 Advertisements published by CondéNast Magazines. From New Yorker Magazine, Fall 2003. 84

Fig. 4.6 These renderings show how façades could serve individual retailers and coordinated public purposes on the Digital Media Street. The top image shows the façade in use by individual retailers and the bottom image shows the façade during a festival. Drawing by Professor Dennis Frenchman, MIT and Lining Geng of Digital Media City research team. Shown at DMC Presentation, Seoul, Korea (23 October 2003) and included in Anthony Townsend, "Digitally Mediated Urban Space: New Lessons for Design," *Praxis* 6 (2004): 100-101. 85

Fig. 4.7 This diagram shows how the façades at street level and for the whole building would be managed in Digital Media City. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003). 85

Fig. 4.8 The Cyberjaya Smart Command Center is intended to act as a coordinating center for the utilities serving the entire development when the park reaches higher capacity. Photograph by author March 2004. 86

Fig. 4.9 Smart homes in Cyberjaya: D'Melor and the Promenade Lakeside. Excerpts from promotional material prepared by master-developer Setia Haruman for D'Melor, Cyberjaya and The Promenade Lakeside housing developments. 87

Fig. 4.10 Two renderings showing how an ambient information system could announce the arrival of the underground at Kendall Square in Cambridge, MA. Several bricks have been replaced by intelligent elements that would change color as the train arrives in the station underground. Meanwhile travelers in the train would be watching taped video feed of the landscape above ground to enhance their experience of the city. Reprinted with permission from Panagiotis Chatzitsakyris, Gonçalo Ducla-Soares, and Alejandro Zulas. "IN-Visible: Perceiving Invisible Urban Information through Ambient Media," CHI 2004 Vienna, Austria (24-29 April 2004). 88

Fig. 4.11 "Moving Audience" project from Fall 2003 Cannes workshop. Reprinted with permission from Lira Nikolovska, Ph.D Student in Design and Computation, Department of Architecture, MIT. 89

Chapter 5

Fig. 5.1 Photograph of Phase Z.Ro Photograph by author March 2004. 92

Fig. 5.2 Rendering of proposed renovation of Chip Bee apartment blocks adjacent to Holland Village. Provided by JTC, March 2004. 93

Fig. 5.3 View of renovated arcades at Chip Bee live-work apartment complex. Photograph by the author March 2004. 93

Fig. 5.4 Sign at Chip Bee live-work apartment complex. Photograph by the author March 2004. 93

Fig. 5.5 Wessex. Photograph by the author March 2004. 94

Fig. 5.6 Renderings of Nepal Park. Provided by JTC, March 2004. 95

Fig. 5.7 Makan Sutra Food Court. Photograph by the author March 2004. 95

Fig. 5.8 Famous ex-pat Col Bar in its new location after it was transplanted from its original site where a new road is under construction by the Land Transport Authority (LTA). Photograph by the author March 2004. 97

Fig. 5.9 Sign posted at the entrance to Makan Sutra Food Court with sign that reads "Please Leave Your Helmets Here!" Photograph by the author March 2004. 98

Chapter 6

Fig. 6.1 Advertising campaign for Cyberjaya in *Lines and Curves: Cyberjaya. A City Inspired.* Setia Haruman Sdn. Bhd. Advertising Publication. 111

Conclusion

Fig. 7.1 Screenshot of Michigan Cool Cities initiative homepage. From Michigan Cool Cities Survey homepage (March 2003), www.michigancoolcities.com. 117

prologue

> I watched her chin lift as she spoke, and realized that she was staring, not at the handsome headland of Cap d'Antibes and the pewter glimmer of the sea, but at the office buildings of Eden-Olympia, at the satellite dishes and microwave aerials. The business park had adopted her.
>
> (J.G. Ballard, *Super-Cannes* [London: Flamingo, 2000], 79.)

Ballard's novel *Super-Cannes* took on new meaning for me when I became involved in a project to develop a new high-tech area in the famous film city on the French Riviera. In his narrative, Ballard describes a science park where a group of researchers engages in illicit activities that ultimately lead to their demise and evoke the social aberrations of our times.

The parallel reality on the ground is of course very different from Ballard's new age tale. The Mayor of Cannes hopes to build on the foundation of the city's film and media reputation as well as the resources of the well-known science park Sophia Antipolis which is located nearby. During the summer 2003, I worked with the Department of Economic Development to collect information, which would become the foundation for an interdisciplinary workshop at MIT. The goal was to explore the potential for an intervention on a particular site near the waterfront on the western edge of the city. My summer experience and the subsequent workshop sparked an interest in me to understand what drives technopole development. Why do city officials develop these plans? Wherein lies their potential? What has changed in the last twenty years?

Working closely with the project and trying to understand stakeholders left me with the desire to explore a phenomenon whose persistence is striking. The "technopole promise" – as one friend put it – continues to puzzle me. I hope that the following pages contribute to an ongoing conversation about how these projects play a role in the urban patchwork of the 21st century.

introduction

An interest in "vibrant urban environments" is sweeping through journalistic and academic writing.[1] Lively places are believed to attract those talented individuals who form the foundation of the knowledge-based economy.[2] Policy makers, public authorities and private developers around the world are responding with various attempts to create and sustain an innovation-based economy by fostering successful urban environments. These actors believe strongly in stimulating urban life to develop competitive residential and business locations.

In the United States, Austin, Texas has established an identity as a leading high-tech city. A downturn in the economy has led local public officials and economic development consultants to revisit the origin of the city's success since the 1990s. In an annual report entitled *The 2004-2005: Economic and Technology Forecast (Austin Metro) The Power of Innovation*, Angelou Economics, a local economic development firm, attributed a part of Austin's success to the urban environment:

> Austin's **active downtown** has helped it attract the much sought after 25-44 year-old demographic. The city has been more successful than other technology communities in appealing to this vital age group, which is highly valued for its contribution to entrepreneurship and the energy it brings to a community. (emphasis added, Angelou Economics, *The 2004-2005: Economic and Technology Forecast (Austin Metro) The Power of Innovation* [Austin, TX: Angelou Economics, 2004], 12, 14.)

The young demographic refers to a flexible and talented community, which is considered an essential part of the innovation and commercialization process:

> Communities that are not actively fostering the growth of an entrepreneurial business environment are going to fall behind. Austin is recognized as a place with **human capital** of the highest quality, a city filled with "serial entrepreneurs" who start multiple businesses and are loyal to the community. (emphasis added, Ibid.)

The report connects human capital to an urban lifestyle and an exciting city culture around a dense, urban center:

> **Vibrant downtowns** cultivate strong communities because they bring people together. A downtown reflects the state of mind and quality of life of its citizens, and an exciting downtown area often incites people to want to stay in or move to a city. The appeal of a lively downtown that mixes restaurants, retail stores, and clubs lies in its concentration of people, businesses, and occasions for networking that lead to the development of new business opportunities. (emphasis added, Ibid.)

The report's language emphasizes vibrancy, mixed-use, convenience – in short – urban life. The trend towards encouraging innovation in "creative cities" has taken many manifestations with the most extreme example perhaps being Michigan Governor Jennifer M. Granholm's Cool Cities initiative. In an attempt to stop the brain drain from downtowns throughout Michigan, the Governor channeled funding towards municipal projects that focus on attracting and retaining young people in urban areas.[3]

Many recent planned science and technology parks, defined later in this introduction as technopoles, conjure up similar images of city life in their project descriptions. Arabianranta in Helsinki, Crossroads Copenhagen in Copenhagen, one-north in Singapore, Digital Media City in Seoul all evoke urban living:[4]

> **Arabianranta** as a Living Lab; Mobile Individuals in Europe/Supporting Individualization of Environments (Arabianranta, Helsinki Virtual Village, Digital Media City Conference, Seoul, Korea, 23 October 2003.)
>
> (1) A vibrant neighborhood: 60% business and office, 20% housing, 20% other (institutions, culture, service); (2) Integrating nature and water (green areas and blue canals); (3) 4 districts each with its own profile based on an overall development plan; (4) High level of infrastructure (Metro, highways, railways, Oersund Bridge to Sweden)
>
> **Crossroads Copenhagen's** Vision: Orestad will become a European large-scale laboratory in which 20,000 daily users and visitors can explore what the Network Society will be and what it will be like living in it. (Crossroads Copenhagen, Digital Media City Conference, Seoul, Korea, 23 October 2003.)
>
> Pulsating with excitement, the Central Xchange [in **one-north**] is designed for a vibrant mix of ICT and media industries. MNCs will be located next to clusters of start-ups in a leading edge building with state-of-the-art technology and facilities...Round the clock urban vitality. (Central Xchange is one of three hubs currently being developed in the project.
> one-north, Singapore, www.one-north.com)
>
> It is an exciting development; a development with a vision of the harmonious co-existence of technology and ecology, cultural and commerce, investment and innovation. We believe that **Digital Media City** will generate the ideas via which the full potential of digital media's application to every aspect of business, personal and community life will be realized: a crucible of innovation...the world's most futuristic urban environment. (*Step Through...The Gateway to Tomorrow: Seoul Digital Media City Where Technology Meets Creativity,* Digital Media City, Prospectus, Seoul, Korea.)

These projects exemplify recent attempts to plan zones – often termed technopoles – where high-tech firms are encouraged to cluster. The schemes emphasize the **urban** nature of the projects as being essential. As we move into the 21st century, project developers are showing a growing interest in providing a unique combination of living and working conditions that can attract the best talent, the wealthiest firms, and the most capital.

Already in 1994, Castells and Hall identified the constitutive features that lead to successful technopoles such as universities, labor pools, and venture capital that have been confirmed by other research groups like IC^2 (*Innovation, Creativity, Capital Institute*, University of Texas at Austin).[5] These elements have become widely accepted as essential ingredients for successful technology hubs inciting public and private actors to search for new ways to differentiate their projects. For a large part, they are expending more energy designing an attractive and unique physical environment conducive to interaction. Castells and Hall predict this trend when they write "image-making has become a central basis for successful competition in our latter-day economy and culture."[6] And the image being sold today evokes a high-tech residential neighborhood where people work and live. Neighborhood services such as schools and retail are integrated with an emphasis on 24/7 life. Telecommunications infrastructure and location-based technologies are embedded in these zones to support the life-style high-tech workers espouse. The thesis asks how urban form is expected to contribute to innovation in technopoles; and how in turn is urban form being reconceptualized at the neighborhood scale.

In particular, the research traces the planning and development strategies used in three Asian cities to attract a creative talent base to technopoles currently under development. From the earliest to the latest attempt (1996 to the present), the three examples are **Cyberjaya – Multimedia Super Corridor, Kuala Lumpur, Malaysia; Digital Media City, Seoul, Korea;** and **one-north, Singapore**. The case study research also describes a fourth example: **Downtown Alliance's** initiatives **in Lower Manhattan, New York**. Since 1995, the nonprofit has been working to attract high-tech economic activity by implementing development strategies that hinge on improving the urban environment as well as the area's telecommunications infrastructure. The Lower Manhattan experience, though not readily identifiable as a technopole, is juxtaposed with the Asian cases. Throughout the comparisons, the text traces an

emerging phenomenon that constitutes one approach to building a knowledge-based economy from an urban development perspective at the neighborhood level (where neighborhood is a geographic area or district of an existing city or urban region).

The terminology used throughout the thesis is distinct from the catch-phrases and buzz-words that permeate large portions of the first-hand documentation and materials published by project sponsors. To distinguish the examples discussed here from the myriad of science parks developed around the world, the French word "technopole" is used. The term describes an international trend in public and private efforts to stimulate regional economic growth by developing large-scale real estate projects for innovative R&D and high-tech production. Depending on its orthography, "technopole" indicates an independent urban entity; or, a center of attraction (a pole or node) within the broader urban context when spelled "technopôle."[7] The range of meaning reflects the diversity among projects, which resemble other mega-projects and urban development schemes, but also include specific characteristics making them high-tech business environments and live-work areas.

Initially, the term technopole referred primarily to the type of business activities concentrated there. With the boom in telecommunications, the tech-aspect also began to allude to better infrastructure, primarily ICT infrastructure and specialized research facilities. Technopoles have evolved from places for advanced high-technology R&D and business into test-beds for new technologies and live-work areas for flexible and mobile knowledge workers. In all cases, project developers[8] implement new ideas to encourage innovation which in turn is presumed to engender economic growth. An important piece of the knowledge-based economy, innovation takes place throughout the process of technology transfer and into commercialization ranging from pure science through product development.[9]

In addition to the lure of high-tech industries, recent economic growth discussions extol the potential for capitalizing on creativity.[10] Vast portions of a raging debate on outsourcing appeal to the United States' ability to reinvent itself through creativity and innovation.[11] A recent report sponsored by the U.S. National Research Council entitled *Beyond Productivity* emphasizes the untapped potential in linking artistic production with ITC research. In the final report, Committee members write, "creative practices – practices of inquiry and production that seek more than routine outputs and aim instead for innovative and creative results – can be encouraged and supported in some very concrete and specific ways".[12]

The technopoles studied here are designed to become both hotbeds of innovation and creativity. They differentiate themselves from other parts of the urban production landscape by being more attuned to emerging live-work patterns among the "most productive" members of the economy. In some cases, adding location-based technologies, wireless environments, and smart building elements to the environment has been emphasized. Other projects focus on quality of life aspects and more basic principles of good urban design and development practice.

In studying current examples, the thesis tries to uncover the underlying assumptions about live-work patterns and competition among locations for talented individuals. As the projects are all still under construction, the thesis provides a base-line analysis for ongoing research on these projects and uncovers opportunities for improving future developments. Thus, the thesis is not a how-to guide for designing technopoles like the one shown in figure 0.1 by *Futurist* magazine. Instead, my goal is to provide a critical analysis of initial research into an emerging phenomenon where physical urban form and strategic positioning for future economic growth go hand in hand. Part of this work includes separating ideologies and assumptions from truly shifting paradigms to provide a better understanding of outcomes and the parallel rescripting of urban space.

The thesis aims to tell the story of this contemporary phenomenon. The first chapter provides an overview of the literature which grounds the research. In particular, the chapter revisits *Technopoles of the World* (Castells and Hall, 1994) which inspired this thesis and is widely cited. The review then expands into more recent research to frame the question of how urban form relates to the technopole phenomenon.

Four cases provide a comparative basis for studying how some cities are attempting to build 21st century milieux of innovation. In Kuala Lumpur, Singapore, Seoul, and New York, project leaders aim to contribute to a competitive urban economy by creating spaces that stimulate innovation and yield derivative economic benefits to the surrounding, geographically connected (but not necessarily contiguous) communities. The milieux of innovation sought after take physical shape in three incipient technopole projects and in Lower Manhattan. All four cases are introduced individually in Chapter 2. Chapters 3, 4, and 5 compare how each of the developments is being implemented in terms of "hardware", "wiring", and "software".

How to Build a Technopole

The implications for technopole policy makers can be summed up in 12 aphorisms:

1. **Build a clear development strategy.**
2. **Branch-plants are better than no plants.**
3. **Synergy as the source of innovation is crucial in the long run.**
4. **Develop a long-term vision.**
5. **Sources of innovation must be identified.**
6. **Networks must be established early on.** There must be networks and channels for information to flow.
7. **Short-distance strategies may be easier.** But even short-distance moves can be negative if the institutions do not communicate with each other. Private laboratories should be encouraged to move at the same time as public research, or there will be no spin-off.
8. **Longer-distance strategies require selectivity.** Building synergistic relationships in outlying regions requires one or two target areas that appear to offer the best prospects in terms of preexisting facilities, such as universities, industrial traditions, entrepreneurial capacities, and political leadership, according to Castells and Hall.
9. **Major central inducements.** Defense spending played a key part in Silicon Valley, for instance.
10. **Identify new niches.** The Ruhr developed specialized high-tech industries to meet local needs, then exploited their export potential.
11. **Keep consistency.** A techno-park, for instance, should not be allowed to degenerate into a pure office park just because it might be profitable.
12. **The best may be the enemy of the good.** "Countries and regions should not seek to judge all their efforts by the most rigorous, exclusive criteria," Castells and Hall conclude.

Source: *Technopoles of the World*

Fig. 0.1 "How to build a technopole?" See Table included in "How to build a technopole," *The Futurist* 29, no. 1 (January-February 1995): 59.

Surprising and contradictory patterns emerge from the cross-cutting comparison, which emphasizes the similarities and differences shared by a diverse set of projects and underscores a common narrative around changing urban patterns in post-industrial live-work environments.

The case observations are organized into findings and conclusions in Chapter 6. As emphasized above, these results are not how-to strategies. The results sketch recognizable

patterns, inherent contradictions and nascent trends that will assist in anticipating the future of these large-scale urban interventions.

(Endnotes)

1 Christopher Shea, "The Road to Riches?" *Boston Globe*, 29 February 2004, www.boston.com/news/globe/ideas.

2 Richard Florida most recently drew much attention to this debate with his book *The Rise of the Creative Class* (New York: Basic Books, Perseus, 2002).

3 Michigan Cool Cities Initiative, homepage: www.michigancoolcities.com.

4 These quotations are taken from presentations held at the Digital Media City Conference held in Seoul, Korea on 23 October 2003.

5 David V. Gibson and Everett M. Rogers, *R&D Collaboration on Trial: The Microelectronics and Computer Technology Corporation* (Boston, MA: Harvard Business School Press, 1994) and David Gibson, Sunil Tankha, and Carlos Quandt, "Incubating and Sustaining Learning and Innovation Poles in Latin America and the Caribbean," IC2 – Innovation, Creativity, Capital Institute, University of Texas at Austin, International Development Research Center Consulting Paper.

6 Manuel Castells and Peter Hall, *Technopoles of the World: The Making of Twenty-First-Century Industrial Complexes* (London, New York: Routledge, 1994): 8.

7 Castells and Hall (1994): 1.

8 Project developers refers to all the actors involved in implementing the technopole projects and not just real estate developers. Throughout most of the thesis, "developers" is used generically and not only in connection with real estate interests.

9 Research conducted by the U.S. Department of Commerce, Economic Development Administration shows how communities can achieve growth in a high-tech economy and how technology transfer and commercialization contribute to economic development. Collaborative Economics, *Strategic Planning in the Technology-Driven World: A Guidebook for Innovation-Led Development*, prepared for the Economic Development Administration, U.S. Department of Commerce (2001). Andrew Reamer with Larry Icerman, Jan Youtie, *Technology Transfer and Commercialization: The Role in Economic Development*, prepared for the Economic Development Administration, U.S. Department of Commerce (2003).

10 Chris Anderson, "The Indian Machine," *Wired Magazine* (February 2004): 99.

11 In a recent editorial, Thomas Friedman writes: "This is America's real edge. Sure Bangalore has a lot of engineering schools, but the local government is rife with corruption; half the city has no sidewalks; there are constant electricity blackouts; the rivers are choked with pollution; the public school system is dysfunctional; beggars dart in and out of the traffic, which is in constant gridlock; and the whole infrastructure is falling apart. The big high-tech firms here reside on beautiful, walled campuses, because they maintain their own water, electricity and communications systems. They thrive by defying their political-economic environment, not by emerging from it." Thomas Friedman, "The Secret of Our Sauce," *New York Times*, 7 March 2004, http://www.nytimes.com/2004/03/07/opinion/07FRIE.html.

12 William J. Mitchell, Alan S. Inouye, and Marjory S. Blumenthal, eds., *Beyond Productivity: Information Technology, Innovation, and Creativity*, prepared for the National Research Council of the National Academies (Washington D.C.: National Academies Press, 2001): 18.

chapter 1
revisiting "Technopoles of the World"

An emerging trend in technopole developments emphasizes the "urban" characteristics of the projects because urban form is supposed to support interaction, which in turn encourages innovation and greases the wheels of post-industrial, knowledge-based economic production. The language used and the strategies deployed evoke images of vibrant 24/7 neighborhoods that can attract talent to technopoles. This model has evolved in the last ten years since Castells and Hall published their much-cited book *Technopoles of the World* in 1994 and differs vastly from the earlier campus-like developments. Delving into some of the diverse literature around technopoles shows that research has focused on these districts as catalysts for economic growth rather than as additions to the urban fabric. The research question focuses on how city spaces are reconceptualized in technopoles at the neighborhood scale because more project developers recognize the value of place in achieving their economic development goals.

In 1994, Castells and Hall published *Technopoles of the World* setting forth a new paradigm for post-industrial production spaces. Since their book, the technopole phenomenon has been studied by academics and consultants from many disciplinary angles ranging from economics, geography, sociology, political economy through urbanism and planning. For a large part, the research focuses on how firms fare in the context of technopoles and what benefits accrue to their surrounding urban regions. These studies provide direct accounts of technopoles and clusters as they have evolved over time (Aydalot, GREMI; Gibson, Kozmetsky, IC^2; Scott; Saxenian; Castells, Hall; Massey, Quintas and Wield). Another body of research studies how telecommunications are changing the spatial distribution of economic activity in urban areas including technopoles as privileged spaces in those networks (Moss, Townsend, Graham, Marvin). Management writers extolling the importance of knowledge work (Drucker), regional growth theories hailing the new economy (Kotkin) and cluster research (Porter) provide source material for many of the economic expansion strategies that

technopole developers promote. The shift to the knowledge-based economy has also attracted researchers studying causal and resulting socio-economic transformations (Carnoy, Castells, Hall). Finally, a literature has emerged emphasizing the importance of place in the wake of the telecommunications boom (Mitchell) which explains ongoing investment in high-quality working environments. The following thesis focuses on the spaces being created in technopoles today and draws on elements of the literature where they enrich the discussion.[1]

The wide range of research reaches back to Castells and Hall who identify growing high-tech zones because they represent an economy emerging from rapid technological change:

> The information they [high-technology products] embody has been created in technopoles, and invariably the embodiment of the information into the products also occurs in technopoles, which thus constitute the mines and foundries of the information age. (Manuel Castells and Peter Hall, *Technopoles of the World* [London, New York: Routledge, 1994], 2.)

The widespread phenomenon indicates a shift towards an information-based economy where research and product development exist within close proximity. In the 1994 study, technopoles are seen as "deliberate" public and private attempts to benefit from the lucrative economic development engines driving the information economy.

The book announces three economic revolutions that presuppose information technologies for their day-to-day functioning: an industrial revolution based on information technologies, an interlinked global economy, and an economic production and management model dependent on processing information.[2] Given these three trends, technopoles provide cities and countries with a competitive edge and a sustained "technological potential."[3]

Castells and Hall identify different types of technopoles that represent "attempts to plan and promote, within one concentrated area, technologically innovative, industrial-related production: technology parks, science cities, technopolises, and the like."[4] Most of the examples they describe differ significantly from their well-known, semi-spontaneous models such as Silicon Valley as well as zones embedded in metropolises.[5] The study proposes five categories of technopoles that represent the observable zones at the time:[6]

1. Spontaneous high-tech regions like Silicon Valley and Route 128 in Boston described as "industrial complexes of high-technology firms that are built on the basis of innovative milieux".
2. Science cities that are research-based and have no connection to manufacturing.
3. Technology parks to "induce new industrial growth" by attracting high-tech manufacturing firms to "a deliberately established high-technology business area, resulting from government- or university-related initiatives."
4. Country-wide technopolis (science city) programs.
5. Old cities that have remained in leading roles in the high-tech economy.

The distinct types have not lost their poignancy today but there seems to be a trend towards inducing new industrial growth (category 3 above) and invigorating technology industries in existing cities (category 5 above). The projects developed today also embrace mixed-use and explicitly model their environments on existing urban spaces to foster innovation.

While stated (and fulfilled) objectives differ among technopoles, the projects are manifest attempts to remain globally and/or regionally competitive through innovation:

> A hasty, hurried study by an opportunistic consultant was at hand to provide the magic formula: a small dose of venture capital, a university (...), fiscal and institutional incentives to attract high-technology firms, and a degree of support for small business. All this, wrapped within the covers of a glossy brochure, and illustrated by a sylvan landscape with a futuristic name, would create the right conditions to out-perform the neighborhoods, to become the locus of the new major global industrial center. (Castells and Hall [1994], 8.)

Success for these new centers depends on the capacity for innovation which resides in the "milieu of innovation." The theoretical underpinnings of the milieu of innovation are discussed prior to delving into the studies. For the moment, the discussion is being confined to the propositions made in *Technopoles of the World* where it says:

> By milieux of innovation we understand the social, institutional, organizational, economic, and territorial structures that create the conditions for the continuous generation of synergy and its investment in a process of production that results from this very synergistic capacity, both for the units of production that are part of the milieu as a whole. (Castells and Hall [1994], 9.)

With a framework in place, the study traces the evolution of technopoles in each of the five categories. Castells and Hall draw a series of lessons from these case studies that support pursuing technopole development in general and from the standpoint of government or private actors for various (sometimes mutually exclusive) reasons. In the best cases, technopoles facilitate the reindustrialization of regions by generating new jobs in new industries that build on synergistic cross-fertilization among firms.[7]

The researchers observe varying degrees of connectivity to an existing urban fabric. In all cases, large institutional actors such as universities and government agencies play essential direct and indirect roles. A financially independent research institution generates new knowledge, trains workers, and launches spin-offs. In all cases, success in a high-tech industry requires significant amounts of venture capital and knowledge. Social networks among firms, subcontractors and long-standing business partners provide the necessary glue for these zones. These factors add up to the "milieu of innovation" mentioned earlier that is specific to each development.[8]

The crux of technopoles' success lies in the balance between business and innovation. In other words, technopoles should facilitate "technological innovation and business entrepreneurialism, without suffocating inter-firm competition and human imagination."[9] Together, a skilled labor force capable of generating valuable information and an abundant supply of capital can unfold their full potential in technopoles driven by private, public, and non-profit entrepreneurs. The series of key elements described above lead Castells and Hall to suggest several tentative policy guidelines whose underlying themes are finding an appropriate development model, stressing long-term goals, and being open to unexpected results in the distant future.

The initiators of the cases described in *Technopoles of the World* aspire to generate innovative technologies, products, and research in high-tech fields. Certain cities or zones have sustained their capacity to make contributions that lead to business success throughout economic downturns. Castells, Hall, Aydalot, and others build on concepts of innovation that assume "cascading" synergistic events over time.[10] These milieux of innovation crop up spontaneously or when specific government or private initiatives generate the right mix of firms and research institutions. And they have emerged in different cities throughout history as Hall observes in *Cities in Civilization:*

> These regions are characterized not by an abundance of fixed resources, but rather by a set of developed social and cultural structures favourable to conceptual advances. They may be old-established, cosmopolitan, liberal metropolitan cities, but are often emerging city regions which serve as entrepôts between the already-developed world and the frontier region beyond it. Their economies are expanding rapidly through imports of goods from that developed world; and they have a high rate of immigration, predominantly of young people, who are highly experimental and untraditional in their outlook. They have strong but often very informal structures for the exchange of technical knowledge and conceptual ideas. Barriers to the diffusion of innovation

> are so low as to be almost non-existent; there is a constant search for the novel. Levels of synergy, not only between like-minded individuals but also between quite disparate socio-economic-cultural groups, are very high; this is the archetype of an open society. (Peter Hall, *Cities in Civilization,* Ch. 9: The Innovative Milieu [Pantheon Books: New York, 1998], 500.)

Hall's powerful image of a "heroic" place persists over time and continues to inspire technopole projects because the "rewards are high; such clusters are engines of economic growth, of enhanced quality of life, and of cultural and political influence – that is, of soft power."[11]

And the power resides with the people living in a particular place at a particular time. Hall defines the city as a geographic entity but also as a milieu of social networks and capital:

> They [cities] resemble nothing so much as huge and complex ecosystems, which must be constantly nourished if they are not to whither and die; and that is what they are, human ecosystems which contain a disproportionate number of the world's most creative individuals. It is their continuous interaction at different levels and in different ways, inside their organizations and in the wider urban milieu, that makes them what they are; just as it once did in Manchester, in Glasgow, in Detroit. (Hall, *Cities in Civilization* [1998], 500.)

Finegold uses the phrase high-skill ecosystem to describe the strong social networks that allow regions to flourish over time.[12] Essentially, an ecosystem consists of highly skilled employees who grow with industry cycles. The resilience of an area depends on employees' ability to reinvent their job description with the economic waves and firms benefit from a large pool of first-rate labor. The model closely resembles previous research by GREMI in Europe who were trying to understand the dynamics of growth poles. However, their analysis focused on the institutional ties within industries rather than the networks among individuals. (According to one GREMI study, three factors attract firms: existing characteristics, better facilities and infrastructure, and synergistic factors that encourage exchange.)[13]

In today's high-tech economy, the underlying assumption is that a technological solution is always available while a useful application needs to be carefully designed. "After all, most technology these days is open source or "off the shelf": the real issue is to know what to do with it, and for this the essential item is talent."[14] In this scenario, the question arises whether and how technopoles continue to furnish the milieu necessary for attracting and sustaining innovation in designing applications for technologies which also makes a case for using technopoles as testing grounds.

Recreating miniature versions of these creative cities within technopoles is a considerable challenge that has grown with increasing faith in the creative, knowledge-based economy. The people or "talent" have choices as to where they would like to locate. As a result, urban form and location have the potential to become draws for communities that fuel innovative business milieux.

In *Technopoles of the World,* urban form is not an explicit question even though the real estate aspects of the developments are emphasized at the outset. The comments made about the design of technopoles emphasize their neutral and nondescript character. The operational definition in Castells and Hall describes a technopole as comprised of a "series of low, discreet buildings, usually displaying a certain air of quiet good taste, and set amidst impeccable landscaping in that standard real-estate cliché, a campus-like atmosphere."[15] The description would probably not entice a young member of the "talent" class to locate in one of these developments!

While the urban form lacks distinction, Castells and Hall make allusions to the spatial implications of synergy. The "short-distance decentralization" to new zones shows that physical proximity to previous and new business partners is a beneficial feature of technopoles.[16] Their emphasis on social structures in technopoles also implies a certain level of density, proximity, and ease of interaction. These late 20th century "information factories" produce a distinct urban spatial configuration. Georges Benko, a French researcher, writes that these centers are "spatial catalyst[s] promoting the formation of a flexible system of accumulation."[17] In other words, technopoles are centers of high value-added economic activities that locate near one another and close to services.[18] While the research has shown that clustering occurs in places like Sophia Antipolis,19 these groupings lack the fine grain of an urban context.

At MIT – arguably one of the world's most successful technopoles – students rub shoulders in an open system that permeates the university. The campus is connected and contiguous in a way that truly encourages interaction even though it does not always exceed a curious peek into a lab along a hallway (facilitated by an increasing number of glass windows). Nevertheless, the potential for interaction is much greater than in a silo-like office environment separated by vast parking lots. Recent examples of technopoles are taking a much more fine-grained approach that uses the individual rather than the firm as its measure shifting the focus from a regional level to an urban development scale.

Some clusters have developed spontaneously such as in Silicon Valley or Route 128 in Boston, Massachusetts. Others have been the result of strategic government intervention in land-use patterns. Sophia Antipolis on the Côte d'Azur in France developed from a very specific government-driven program to diversify the economy on the Riviera.[20]

Today's emerging pattern resembles an urban center in contrast to the suburban characteristics of traditionally cited spontaneous technopoles such as Silicon Valley and Route 128 in Boston in the United States or Cambridge, UK and Sophia Antipolis, Nice in Europe. These areas resulted from local zoning regulations or specific planning principles of the time. For example, Sophia Antipolis's urban layout was modeled on a regional growth strategy and a modernist urban planning doctrine. Some of these planned and unplanned zones and especially regions were and remain extremely successful as they reinvent themselves.[21] For new developments, however, economic shifts imply an increased urgency to consider the importance of urban spatial configurations for technopoles as potential draw-factors for skilled labor, venture capital, and business entrepreneurs.

Developers usually site new science park projects on the urban periphery or in entirely new development zones. Often government programs and incentives determine project locations and style. Technopoles range in size from the smallest 20 ha, small-mid 20-60 ha, mid-big 60-100 ha, large greater than 100 ha.[22] Some of the most well-known areas like Silicon Valley, USA Cambridge, United Kingdom or Sophia Antipolis, France cover very large areas (exceeding 100 ha). Varying degrees and types of government intervention have impaced these developments.

Scale and goals vary from site to site but generally technopoles have evolved from economic development projects into multi-faceted systems for drawing creativity and innovation to a city or region. Experience makes the strongest case for coupling research-based institutions with high-technology firms to promote change. The model relates back to the historical development of Silicon Valley and Route 128 which benefited significantly from the presence of Stanford University and MIT respectively.

The evolution of technopoles can be traced in the history of Sophia-Antipolis, the "Silicon Valley of Europe." A greenfield development between Cannes and Nice, Sophia-Antipolis was conceived to diversify the region's tourist-based economy and become a model living and working environment. Under the guidance of a rigorous real-estate development

strategy, well-known firms and respected educational institutions have clustered in the area. And Sophia-Antipolis continues to successfully attract newcomers but has been struggling to support those small firms so often associated with high-technology. The limitations of a sprawling development (2,300 ha) have also decreased the quality of life within the park even though strict land conservation has been successfully enforced (only one third of the land is built-up).23

As in Sophia-Antipolis, technopole urban design and masterplan strategies rarely reflect the intensity of interaction necessary for sustaining and promoting the type of information spillover integral to triggering new ideas. Many technopoles are not connected to their surrounding urban fabric as they are constructed on greenfield sites. Land assembly in urbanized areas requires significant political and financial support both of which played an essential role in Sophia-Antipolis's emergence.

The type of urban spatial patterns that lead to innovation are difficult to track. Richard Florida from the University of Carnegie Mellon has received much attention for his book *The Rise of the Creative Class* (see figure 1.1). He makes a socio-spatial argument for the development of innovation-based communities and derives part of his argument from Jane Jacobs's classic description of Greenwich Village in New York City:

> What made Hudson Street [in reference to Jane Jacobs] work was its combination of physical and social environments. It had short blocks that generated the greatest variety in foot traffic. It had a wide diversity of people from virtually every ethnic background and walk of life. It had wide sidewalks and a tremendous variety of types of buildings – apartments, bars, shops, even small factories – which meant that there were always different kinds of people outside and on different schedules. And it had lots of old, underutilized buildings, ideal for individualistic and creative enterprises ranging from artists' studios to entrepreneurial shops. Hudson Street also fostered and attracted a certain type of person – Jacobs's all-important "public characters" – shopkeepers, merchants and neighborhood leaders of various sorts. These people, the antithesis of Whyte's organization men, played a critical role in resource mobilization. Performing a catalytic role in the community, they utilized their position in social networks to connect people and ideas. The creative community, Jacobs argued, required diversity, the appropriate physical environment and a certain kind of person to generate ideas, spur innovation and harness human creativity. (Richard Florida, *The Rise of the Creative Class* [New York: Basic Books, Perseus, 2002]: 42.)

Florida asserts that Jane Jacobs was describing the ideal environment for the members of the creative class, which he describes in the rest of his book:

Fig. 1.1 Blandburg versus Hipsterville, Illustration from newspaper article. See Christopher Shea, "The Road to Riches?" *Boston Globe* (29 February 2004): D1.

> For much of the past half century, intelligent observers of modern life believed it was Whyte's world that had triumphed. But now it appears that Jacobs's world may well carry the day. Not only are urban neighborhoods similar to Hudson Street reviving across the country, but many of the principles that animated Hudson Street are diffusing through our economy and society. Workplaces, personal lives, entire industries and entire geographic regions are coming to operate on principles of constant, dynamic creative interaction. (Florida [2002]: 43.)

Florida believes that the spatial configuration of the neighborhood initiated a type of interaction that is desirable in today's society and beneficial to the knowledge-based economy. He relates urban form and diversity to knowledge spillover. While these interactions may enhance the quality of community he makes a leap to paint Greenwich Village as an ideal case. And he does not address the role of diversity or hierarchy at all in establishing how knowledge exchange takes place in the community which is a key aspect in innovation-based growth. When Jacobs wrote *The Life and Death of American Cities* immigrant culture defined neighborhoods in New York and family structures were more rigid. The social and spatial context of the

neighborhood Jacobs was describing does not model how innovation clusters or creative knowledge workers function today. Even if those workers choose to live in Greenwich Village today the neighborhood fabric is much changed.

Setting aside the debate over cause and effect of vibrant urban neighborhoods as it is posited by Florida, the discussion does make a strong argument for the power of place. Finegold notes the importance of environmental factors, especially before a critical mass of workers has been established:

> As improvements in telecommunications give knowledge workers and the firms that employ them far more location options, other elements of the external environment become increasingly important in determining where high-skill enterprises will cluster. Individuals can focus more on where they want to *live,* rather than where they have to *work.* Thus, depending on their stage of life, they may place a premium on factors such as climate, and the availability of cultural, recreational, or other leisure activities, and/or the availability of affordable housing, safe neighborhoods, and high-quality schools. One important caveat to the above factors, however, is that another clear attraction for knowledge workers is being close to others who share the same expertise. (David Finegold, "Creating Self-Sustaining High-Skill Ecosystems," *Oxford Review of Economic Policy* 15, no. 1 [1999], 69.)

In his study of the relationship between telecommunications and urban form, Horan uses the anthropologist Ray Oldenburg's[24] notion of "third places" as an example of the types of space that are needed to augment the simple two-way split of home and work: "The notion of *meaningful places* embodies the need to design digital places in a manner that respects the functional and symbolic associations that places often contain".[25]

Connecting questions of urban form with the underlying drivers of high-tech innovation in the era of post-industrial production brings the argument back to the projects being proposed in cities around the world (Singapore – one-north, Seoul, South Korea – Digital Media City, Kuala Lumpur, Malaysia – Multimedia Super Corridor, Lower Manhattan – Downtown Alliance's work) which are at the neighborhood or city district scale. Project designers are proposing dense, exciting city living with convenient services and proximity to jobs to draw the right mix of residents, workers, and firms to support a self-sustaining cycle of innovation. In most cases, the goal is to serve as a local, regional, and global focal point for existing and future knowledge-based economic activity. Observable trends, anecdotal evidence, and knowledge of the local contexts justify these projects for the initiators in the spirit of preparing for future waves of economic prosperity.

The urban neighborhood in the industrial age, however, rested on a very strong social

network and specific family structures that are not characteristic of high-tech workers today. Martin Carnoy describes the current situation:

> In addition to the meaning and structure of the family having changed, the communities that had emerged from the Industrial Revolution, such as the factory towns and industrial cities with their ethnic and other highly organized suburban enclaves, had broken down in the postindustrial flight to the new urban formations Francois Ascher calls "metapoles" (Ascher 1998). A wave of accelerated territorial urban and suburban sprawl has by and large undermined the material base of neighborhood sociability. Globalization produces less secure and more dispersed work arrangements than earlier organizations of production. Families with two working adults are the norm, and parents and children tend to build networks within the variety of institutions in which they spend their time rather than socializing with neighbors. This makes these already semitransitory communities even less relevant to the integration of the disaggregated workers of the globalized age. (Martin Carnoy, *Sustaining the New Economy. Work, Family, and Community in the Information Age* [Cambridge, MA: Harvard University Press, 2000], 7.)

If Carnoy's analysis of the society in the information economy is correct envisioning urban neighborhoods as technopoles for innovation seems wishful thinking. Carnoy's extreme position probably does not reflect reality in all suburban communities where vibrant sociability does exist even though it might be mediated by the car. And competing histories exist on the original driving force of industrialization where many single family members were as independent as today's knowledge workers before forming closer family units in urban neighborhoods like Greenwich Village.

Some of the evidence from the suburbs and increasing mobility does indicate that the social organization necessary to generate a beneficial climate for innovation does not correspond to the geographic structure of the neighborhood (creative or otherwise) and should not be mistaken as such; even when some aspects physically resemble typical neighborhood features like Oldenburg's third spaces. Some of these third spaces may become fertile ground for knowledge workers, but they are not a revitalization of the past.

Michael Johns makes a similar case for an incongruity between social structure and urban fabric when he points out that gentrification in older urban neighborhoods is more a marketing tool than a true revitalization of urban living as it existed.[26] Some of these gentrifiers may be working in high-tech domains and they miss the diversity they sought by moving to the city. If new technopoles are designed to accommodate flexible live-work scenarios they will face the same challenges that currently exist in revived neighborhoods that have lost their long-standing, geographically congruent social networks. This argument does not negate the ongoing existence of community in the information age within or outside of the virtual realm.[27]

However, it does not go without saying that these communities are embedded or rooted in place, which is one of the key paradoxes behind the observed technopoles. In these projects, there is an assumption that community will emerge in new spaces through interactions that spawn economic growth.

And strong neighborhood social networks hook into wider urban and inter-urban networks. In fact as advantaged places within the telecommunications network, technopoles tend to be more connected to other privileged areas than their surrounding urban fabric. In *Splintering Urbanism* Simon Marvin and Stephen Graham describe how new technologies shape different zones of cities and why architecture, sociology, and geography have neglected infrastructure questions:

> Virtually all cities across the world are starting to display spaces and zones that are powerfully connected to other 'valued' spaces across the urban landscape as well as across national, international and even global distances. (Stephen Graham and Simon Marvin, *Splintering Urbanism: Network Infrastructures, Technological Mobilities, and the Urban Condition* [London and New York: Routledge, 2001], 15.)

Neighborhood identity and strength are based on an urban territorial logic that does not neatly coincide with an emerging, international network of privileged and competitive places some of which are technopoles. In the long run, engendering a successful milieu requires balancing the privileged nature of the technopole with intact local connections as Marvin and Graham suggest: "Premium network spaces must continue to maintain connectivity with wider, public infrastructure networks and systems of technological mobility."[28] Evoking neighborhood models for technopoles is thus part of a complex rescripting of urban space on the cusp of the 21st century that may or may not announce a new interest in recombining the splintering elements of post-industrial urbanism.[29]

The role of information technologies and telecommunications is by no means value neutral in this process of rescripting. However, it is also very difficult to predict as Stephen Rheingold's *Smart Mobs* shows very clearly. Users appropriate spaces and technologies in unexpected ways. Especially mobile and wireless capabilities prove elusive because of their distributed nature. Developing guidelines and implementing pilot projects where a conscious effort is made to enhance the value of real estate by providing certain infrastructure or services have yet to be tested on a larger scale.

Bearing in mind the challenges mentioned above, the stakes for designing centers of

innovation have increased as we move further into the 21st century and observe the cycles embedded within the new, information driven economy:

> The illusion of a world made of Silicon Valley-like societies driven by technological ingenuity, financial adventurism and cultural individualism, high-tech archipelagos surrounded by areas of poverty and subsistence around most of the planet, is not only ethically questionable but, more important for our purpose, politically and socially unsustainable. (Manuel Castells, "Information Technology and Global Capitalism" in Will Hutton and Anthony Giddens, eds., *On the Edge. Living with Global Capitalism* [New York: The New Press, 2000], 67.)

Castells describes the potential consequences of unrealistic and polarizing technopole projects. However, avenues exist for technopoles to become models of urban development patterns and post-industrial-production spaces. In 1996, Castells proposed the "space of flows" as the "*the material organization of time-sharing social practices that work through flows*" in the globalizing, network society. Technopoles are places of concentration within networks that carry flows.[30] Current attempts to develop technopoles enhance the vision by proposing the potential for technopoles to become multi-use urban neighborhoods that accommodate urban life and production. As these visions are implemented true motivating factors and realities will emerge that must be monitored and openly discussed.

Revisiting these issues through detailed case studies of several current technopole projects will shed light on how these projects should be considered and why current project originators are emphasizing urban form. How does urban form contribute to the process of innovation in technopoles? And more importantly, how is urban form being reconceptualized for the knowledge-based economy within these technopoles? None of the theories demonstrated above fully explains the technopole phenomenon much less predicts the outcome or potential success of such planned efforts to spark high-tech development. Instead, applying critical analysis to ongoing projects reveals many of the inherent contradictions within them and some hints of emerging patterns.

(Endnotes)

1 Manuel Castells writes: "The new breakthrough in urban studies in the coming years will be based on the integration of an eco-social approach with a techno-economic study of cities, and with an urban design perspective, within the context of a cross-cultural, comparative framework." In "The Culture of Cities in the Information Age," (1999) in Ida Susser, ed., *The Castells Reader on Cities and Social Theory* (Oxford: Blackwell, 2002): 386.

2 Manuel Castells and Peter Hall, *Technopoles of the World: The Making of Twenty-First-Century Industrial Complexes* (London and New York: Routledge, 1994): 3-4.

3 Castells and Hall (1994): 5-6.

4 Castells and Hall (1994): 8.

5 Castells and Hall (1994): 9.

6 Castells and Hall (1994): 10-11.

7 Castells and Hall (1994): 223-224.

8 Castells and Hall (1994): 227-234.

9 Castells and Hall (1994): 237.

10 Castells and Hall (1994): 226.

11 William J. Mitchell, Alan S. Inouye, and Marjory S. Blumenthal, eds. *Beyond Productivity: Information Technology, Innovation, and Creativity* (National Research Council of the National Academies. Washington D.C.: National Academies Press, 2001): 27.

12 AnnaLee Saxenian describes the strength of Silicon Valley in the same way: "The region's dense social networks and open labor markets encourage experimentation and entrepreneurship." In "Lessons from Silicon Valley," *Technology Review* 95, no. 5 (July 1994): 44. See also, AnnaLee Saxenian, "Silicon Valley versus Route 128," *Inc.* 16, no.2 (February 1994): 25-26.

13 Remigio Ratti, Alberto Bramanti, and Richard Gordon, *The Dynamics of Innovative Regions: The GREMI Approach* (Aldershot: Ashgate, 1997).

14 Manuel Castells, *The Internet Galaxy. Reflections on the Internet, Business, and Society* (Oxford: Oxford University Press, 2001): 79.

15 Castells and Hall (1994): 1.

16 Castells and Hall (1994): 233-235.

17 Georges Benko, "Technopoles, High-Tech Industries and Regional Development: A Critical Review." *GeoJournal* 51 (July 2000): 157-167.

18 Thierry Bruhat, leading French technopole consultant.

19 Sophia Antipolis is one of the first technopoles developed in France near Nice.

20 Benko, (July 2000).

21 Silicon Valley is able to remain economically competitive and has lived through several waves of high-tech developments.

22 International Association of Science Parks (IASP), http://www.iaspworld.org/

23 Based on on-site research conducted during the summer 2003.

24 Ray Oldenburg, *The Great Good Places: Cafes, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts and How They Get You Through the Day* (New York: Marlowe & Co. 1997).

25 Thomas Horan, *Digital Places: Building Our City of Bits* (Washington D.C.: Urban Land Institute, 2001): 15.

26 What lies behind all this residential development, of course, is the idea of "the neighborhood." A New York real estate broker described gentrifying blocks above 96th Street along Broadway as "just so 'neighborhood.' " Hundreds of newspaper and magazine articles depict an "old neighborhood feeling" in gentrifying districts everywhere. Or they discover, as one recently did in the area around Madison Square Park, "a sense of community and shopkeepers who provide old-fashioned courtesies." Michael Johns, "The Retro City," *New York Times*, 4 January 2004, Section 1, 1.

27 See two articles by Hampton in Barry Wellman and Caroline Haythornthwaite, eds. *The Internet in Everyday Life* (Malden: Blackwell, 2002).

28 Stephen Graham and Simon Marvin, *Splintering Urbanism: Network Infrastructures, Technological Mobilities, and the Urban Condition* (London and New York: Routledge, 2001): 390.

29 Lower Manhattan is an example of an existing environment that has many parallel identities that overlap and intersect each other in the same urban spaces. The city is at once local community, financial capital of the world, tourist destination, the original downtown, telecommunications hub, and so one.

30 Manuel Castells, "The Space of Flows," (1996, 2nd ed 2000) in Ida Susser, ed., *The Castells Reader on Cities and Social Theory* (Oxford: Blackwell, 2002): 344.

chapter 2
introducing the case studies

The four selected cases cover a range of conditions to gain a better understanding of 21st century technopole projects. These examples differ from traditional urban mega-projects by their program, implementation and integrated economic development and planning strategies. While they share many common aspects with large-scale development or new towns they differ substantially from one another as will become clear in the following introductions and subsequent analyses. The Multimedia Super Corridor and its core, Cyberjaya are located in Malaysia, a multiethnic and newly industrializing country. Cyberjaya evidences the most influence from 1990s attempts to develop technopoles but continues to evolve. Digital Media City and Digital Media Street in Seoul, Korea mark a shift towards urban technopole projects and a conscious effort to integrate technology into the environment which characterizes them. one-north in Singapore provides a more recent attempt to develop a different kind of technopole. Downtown Alliance's work in Lower Manhattan provides a counterpoint because it takes place in an existing urban context. Unlike the three comprehensive technopole projects, the Lower Manhattan case shows how a similar agenda can be pursued by overlaying certain infrastructures and marketing efforts onto an existing urban environment. It should also be noted that the projects are not all explicitly named "technopoles." However, each one includes certain characteristics that are typical of technopoles and announce a break from the 1990s: (1) urban designs that resemble urban settings, (2) emphasis on technological infrastructure, and (3) incentives for R&D and high value-added economic activity.

In the first part, this chapter provides a framework for thinking about the innovation environment, which all four cases aspire to generate. With this framework in place, each project is introduced individually to provide essential background information. The last section describes the methodology used and maps out the comparative case analyses.

Building a Milieu of Innovation

The development teams aim to attract "talent" to their project by developing highly stimulating urban environments. While many factors attract talent, two are of particular interest in connection with urban form in a milieu of innovation: density and technology. Density becomes a proxy for "urban" in many development descriptions. In some cases, this notion translates directly into dense urban fabric, but in other cases it remains an abstract concept applied to the density of intellectual activity.

Technology in this context means the degree to which telecommunications, location-based services, and research facilities are embedded within the built urban fabric. Economic activity and everyday life-style are fused with technology in current-day technopoles.[1] The potential for cross-industry collaboration may also be enhanced as core industries and service industries adopt the same electronic telecommunications networks, which eases exchange.[2]

Even though density and technology are not the only factors that contribute to a milieu of innovation, they are fundamental to many arguments for technopoles as centers of heightened activity within a network of "high tech" areas or as locations with premier telecommunications infrastructures and an existing context that should encourage a "high tech" based economy. Overall, telecommunications facilitate certain kinds of dispersal while simultaneously stimulating more face-to-face interaction.[3] Asynchronous and synchronous wireless and wired communication make it easier to coordinate exchanges in advance and at a distance. These systems also allow uses to overlap in new ways facilitating non-uniform densification and distribution.[4]

These strategies point to an underlying theory of city formation where density and concentration of services and people are the primary reason for cities existing at all. William Whyte makes a "case for crowding" that rants against suburban sprawl because "to do away with congestion, these plans would do away with concentration. But concentration is the genius of the city, its reason for being."[5] These "high tech" developments reframe fundamental questions of city living as they were debated in the post-WWII era and make a case for urban concentration which project developers equate with higher levels of creative talent.

Multimedia Super Corridor - Cyberjaya, Malaysia (MSC)

The Multimedia Super Corridor (MSC) covers an area approximately 50 km by 15 km and includes two "intelligent cities": Cyberjaya, and Putrajaya, the new administrative capital of Malaysia (see figure 2.1).[6] The area encompasses existing urban areas as well as greenfield sites and the new international airport KLIA. The project was initiated by the Federal Government under Prime Minister Mahathir in 1996.[7] With guidance from economic adviser and confidante Kenichi Ohmae,[8] Mahathir launched an international campaign to market the MSC to international investors. Within MSC boundaries, firms of MSC-status are provided with fiscal and infrastructural benefits. Recently implemented IP regulations or "cyberlaws" are intended to further enhance the attractiveness of locating within the MSC. Seven "Flagship applications" are intended to be developed by firms within the MSC (smart schools, multipurpose card, e-government, R&D, technopreneurship, telehealth, e-commerce).[9]

On May 17, 1997, the groundbreaking ceremony for Cyberjaya launched development within the 2,890 ha (7,000 acres) flagship zone (CFZ) where international and local companies are encouraged to locate. The CFZ site shown in figure 2.2 is larger than Singapore.[10] An estimated 15 billion USD will be spent over twenty years.[11] In the first phase of the CFZ development, 1,460 ha (3,600 acres) have been under development since July 8, 1999.[12]

The Multimedia Development Corporation (MDC) – founded in 1996 – spearheads the marketing of Cyberjaya and MSC to local and foreign companies. The scope of MDC's work is very broad and it seems increasingly focused on national strategies.13 Still, the group continues to woo investors to locate in the flagship zone. Cyberjaya could be labeled the technopole within the larger MSC areas and is located adjacent to the national administrative center, Putrajaya, 35 minutes south of Kuala Lumpur and approximately 20 minutes by light rail from Central Station in Kuala Lumpur. Cyberjaya is readily accessible from major highways leading to downtown Kuala Lumpur.

Setia Haruman Sdn. Bhd. (SHSB) has been named the master developer of CFZ to implement the masterplan established by the Federal Town Planning Department of Peninsular Malaysia and administered by the Sepang District Council (SDC) (see figure 2.3). Development proceeds when SHSB sells land to developers for zoned uses, which fall into four major categories: enterprise, commercial, residential, and mixed-use. The enterprise zones provide benefits to firms under the MSC strategy.

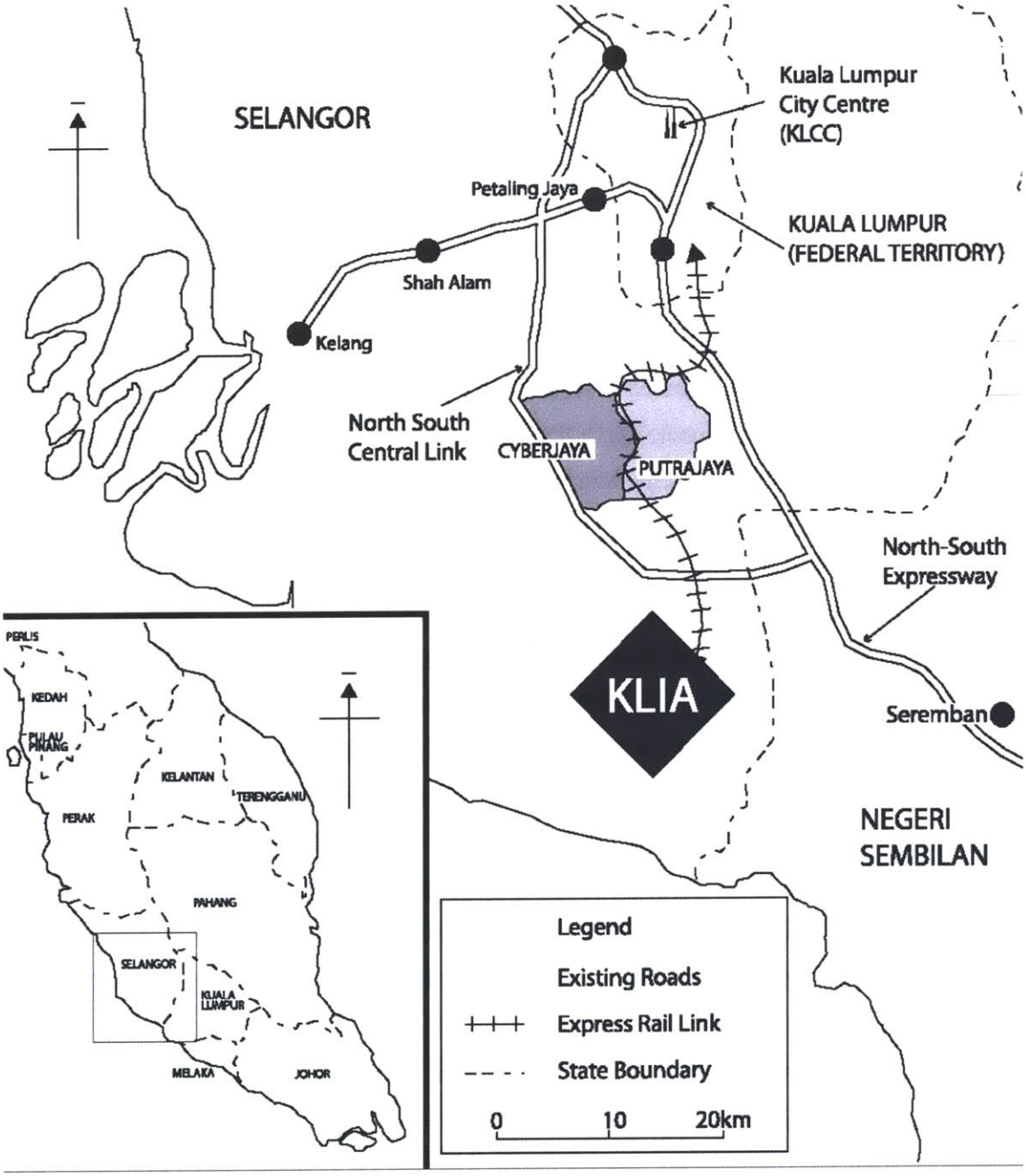

Fig. 2.1 Map of Malaysia and zoom on location of Cyberjaya. See Marc Boey, "(Trans)national Realities and Imaginations: The Business and Politics of Malaysia's Multimedia Super Corridor," Ch. 8 in *Critical Reflections on Cities in Southeast Asia* (Singapore: Times Academic Press, 2002): Figure 8.1.

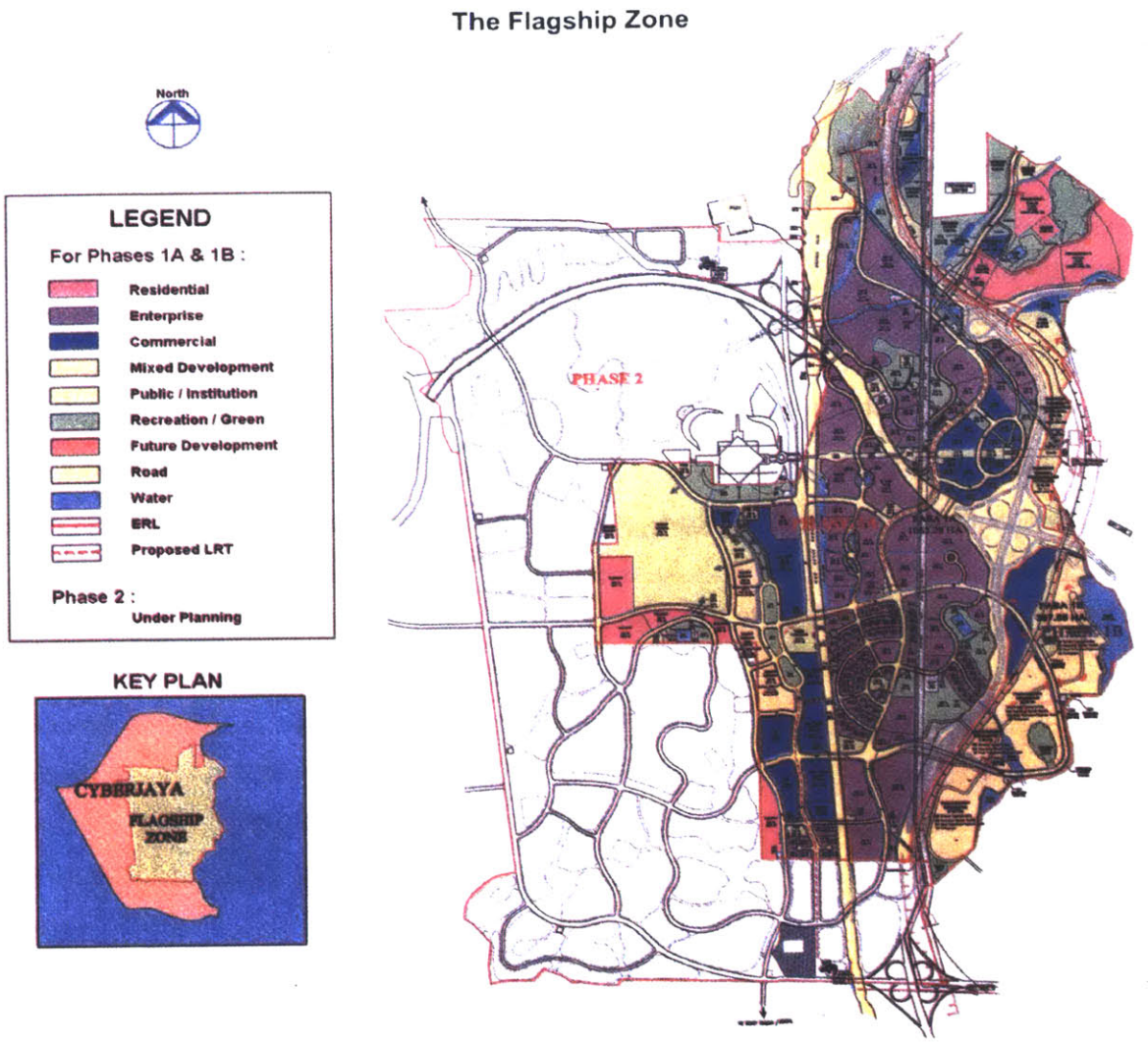

Fig. 2.2 Cyberjaya Flagship Zone. See Federal Department of Town and Country Planning Peninsular Malaysia, *Physical Planning Guidelines for the Multimedia Super Corridor* (September 2000): Figure B2.4.1.

Fig. 2.3 Cover of *Physical Planning Guidelines for the Multimedia Super Corridor* developed by the Federal Department of Town and Country Planning Peninsular Malaysia, (September 2000).

In addition to managing land sales, SHSB also acts as contractor for certain projects. In the early phase of Cyberjaya, SHSB developed several multi-tenant buildings. Currently, SHSB is constructing residential buildings to boost the area's critical mass. The government has also entrusted SHSB with a contract for providing public amenities in the CFZ. One other property developer is constructing residential buildings and approximately nine developers are involved in office projects in Cyberjaya.[14] The Cyberjaya Visitors Map in figure 2.4 shows SHSB development.

SDC provides planning and building approvals under existing federal guidelines and local zoning law. In practice, the two volume set of urban design guidelines does not restrict firms to develop buildings to their specifications, which are reviewed with a One-Stop Agency, a committee to expedite the permitting process for building plan submissions. The Agency communicates with technical departments under the SDC and makes recommendations for approval. After the technical departments have completed their inspections, SDC provides final approvals on recommendation of the committee. In total, 251 companies have located within the flagship zone of Cyberjaya. Several large firms such as DHL, BMW, Shell IT International, HSBC and Ericsson have developed their own office buildings. These tenants establish long-term leases with the building owners (SHSB in the case of Shell IT International and Ericsson). Ericsson conducted an international competition to select the architect for its building. DHL and BMW worked with turnkey developers who bought the land from SHSB. One multi-tenant zone named Century Square includes five office buildings and one commercial building owned by SHSB. Shell IT International occupies two of the five office buildings. Cyberview Sdn. Bhd. has also established a Small and Medium Enterprise Building within the Century Square complex (see

Fig. 2.4 Map of Cyberjaya exhibited at Setia Haruman Offices in Cyberjaya, Malaysia. Photograph by author March 2004.

figure 3.4). A second mixed-use zone with 10-11 blocks is under construction around the most popular retail area, Street Mall (see figure 3.7). The area combines indoor and outdoor features. Some government uses like Bank Negara's (National Bank) Data Center will transfer to Cyberjaya.[15] Two commercial areas including a food court (total 56,000 square feet) and two technology universities (Multimedia University (MMU) – 7,000 students and Limkokwing University College of Creative Technology (LUCCT) – 4,000 students[16]) have opened their doors. 1,700 residential units and Cyberview Lodge Resort and Spa provide residential uses within the park.

Overall, half the site is intended for residential uses and 49% of the site must be preserved for open space (30%) and public amenities (19%). Height restrictions differ for various uses: Offices in the Enterprise Zone may not exceed four stories (FAR 1) while commercial buildings may reach eight stories in the Commercial Zone (FAR 4). Residential buildings are zoned for a maximum of ten stories.

Wide roads, a soon to be opened smart primary school and the development of a large park anticipate the arrival of more residents. The current population of Cyberjaya has reached 19,000: 11,000 students and staff of MMU and LUCCT; 2,000 residents; and 7,000 employees. CFZ is intended for 120,000 residents and 50,000 employees.[17] The first phase of Cyberjaya is slated for completion by 2005 and phase two is planned for 2006-2011. As a result of the scattered development pattern most workers (87%) travel to Cyberjaya by car while the remaining workers rely on feeder buses to the light rail station and public commuters buses from downtown Kuala Lumpur.

Prior to recent elections there was some doubt as to how MSC would continue under new leadership. However, Malaysians elected the governing coalition in a large win over the major Islamic opposition party and new Prime Minister Abdullah Badawi was sworn in on March 23, 2004. The new Minister of Science, Technology and Innovation Datuk Dr. Jamaludin Jarjis has already announced a blueprint plan for the future of MSC and Cyberjaya through 2010 to be distributed in May 2004.[18] Road, telecommunications, and services infrastructure for the first phase of Cyberjaya are slated for completion by 2005. Phase II is projected for 2006-2011.

DMC – DMS, Seoul, Korea (DMC)

In 1997, Mayor Goh, former Mayor of Seoul, Korea and Vice-Mayor Hong Bin Kang began forming a vision for a defunct land-fill site located on the northern edge of the Seoul metropolitan area as a business district. The 6.6 million square meter site (54 ha or 135 acres) is located in the Sangam District of Seoul near the Incheon International Airport, which is connected to downtown by a high-speed train with a stop at the site as the aerial view in figure 2.5 shows. The main rail line to North Korea, China, and Russia borders the northern edge of the site. The large-scale project, 20 minutes from downtown is one of the last contiguous developable areas within the city.

The Digital Media City (DMC) refers to the mixed use "downtown" of the huge Sangam project, where the Digital Media Street will both symbolize and tie together the key public and private functions of the downtown area. Mayor Goh aimed to develop a multimedia district that would attract international industry leaders and serve as a focal point and experimental zone for an existing, vibrant IT and media industry. DMC is part of a whole network of technology clusters around and in Seoul. The Digital Media Street (DMS) has also been designed as a test-bed for experimental and innovative mixes of media technologies; the core of the city where the truly innovative aspects of the project unfold.

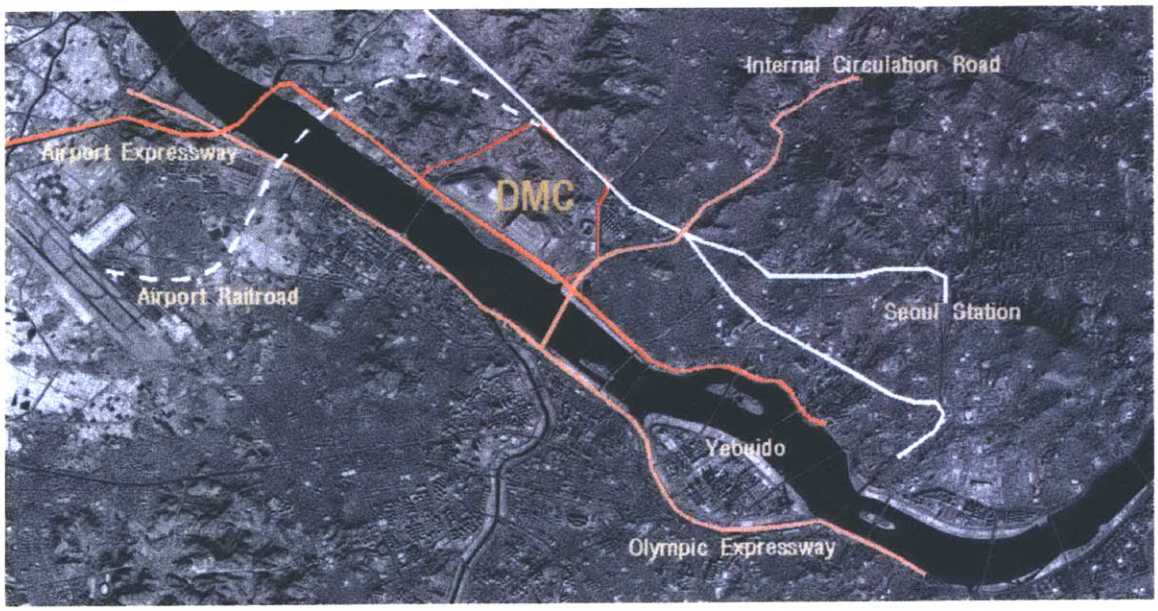

Fig. 2.5 Aerial view of Seoul showing the location of Digital Media City. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003).

Seoul Development Institute and MIT developed a plan for the DMS that takes cues from existing Korean streetlife:

> Seoul today has some of the most exciting streets in the world where digital communications and media are already part of everyday life. The DMC builds on this existing context. (Dennis Frenchman, Digital Media City Conference in Seoul, Korea, 23 October 2003.)

From 2001-2002, a team of designers and consultants led by Professor Dennis Frenchman from MIT's City Design and Development group, MIT Senior Lecturer Michael Joroff, a Korean design firm named Archiplan and the Seoul Development Institute created a masterplan (figure 2.6) for the Digital Media City (DMC) and its centerpiece the Digital Media Street (DMS).[19] The core function areas of the plan are for locating leading media industries, broadcast companies, education and cultural institutions, hotels, retail and entertainment uses, and many digital media pilot projects. Other recommended uses are venture facilities and HQs of companies and general business and urban services. The street is crossed by two key spines emanating from the new international, high speed train/subway station, a key focus of the project, and the first stop in the city from the airport and North Korea: One crossing links the station through downtown cultural facilities to a high school and a major residential area; the second crossing links the station through downtown high-density hotel and office projects to major parks and recreation.

The centerpiece of the plan is a curved street which passes through the districts with different identities expressed in experimental mediated public space emphasizing:

- One zone is devoted to incubator research and development firms, focused on a "digital park providing an extension of the workplace".
- One piece is a live-work community, organized around an urban residential park and gallery spaces devoted to digital environmental art (and a new home for the Seoul media art biennial).
- A civic and cultural center, also the focus of major broadcasting companies, museum, and media laboratories
- An urban entertainment district and plaza with more conventional high tech/high-rise entertainment, hotel and major office space including a proposed 100-story building

Urban design guidelines were developed to ensure mixes of use at the pedestrian level – including a requirement that at all firms located in the DMC have a presence (digital or physical) on the Street to generate a human-scale experience. Building design is guided at

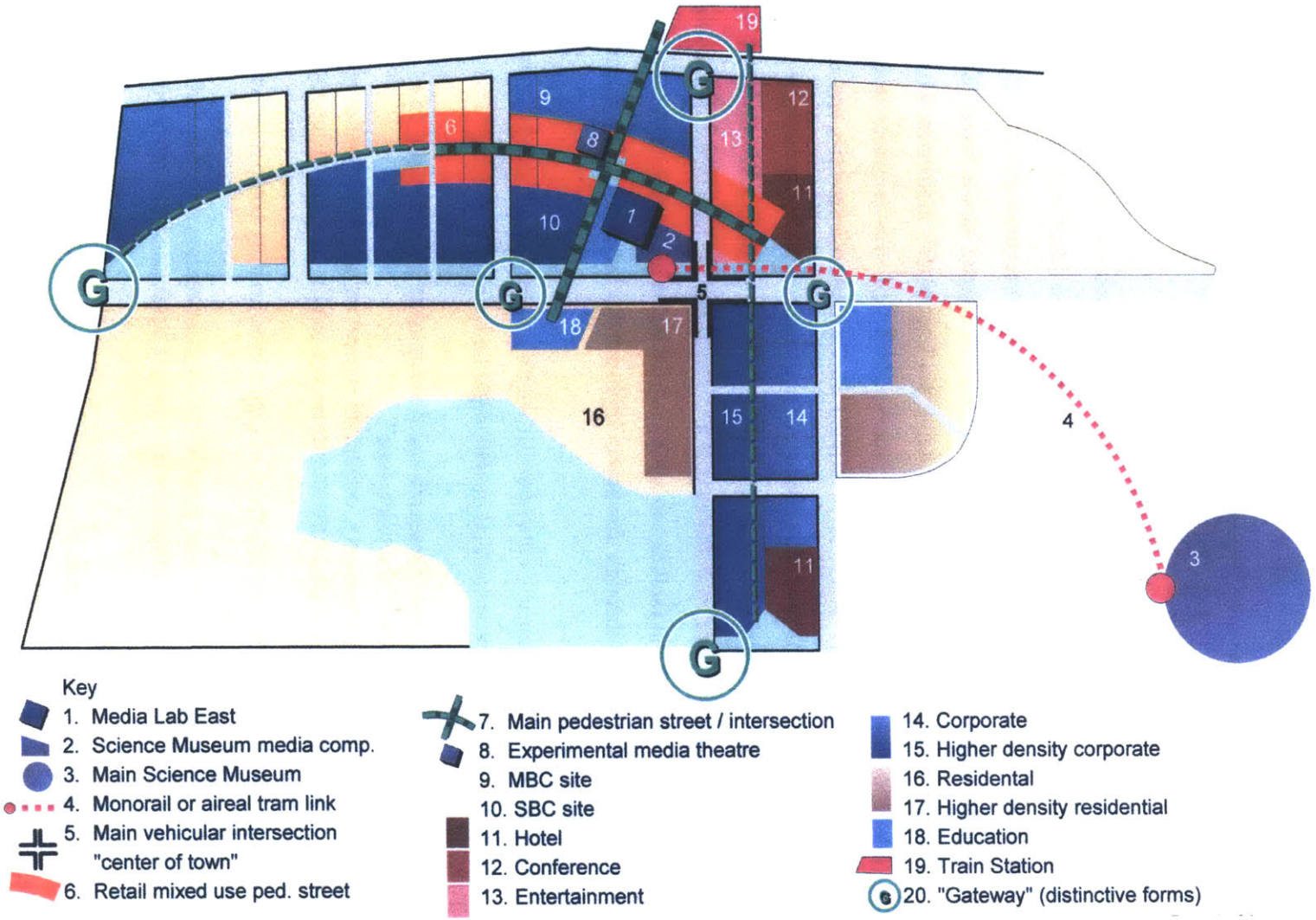

Fig. 2.6 | Digital Media City Concept Plan. Dennis Frenchman, MIT, City Design and Development Group, 5/20/02..

the lower, street-level, where all uses are required to have programmable digital signage. The project uses digital media to "enhance the quality of work and life." The street environment has three characteristics:

- Intelligent infrastructure: new kinds of media supportive street fixtures, managing flows of traffic and people, public information.
- Permeable street edges: transparent façades, diversity of activities and uses, digital communities and links, digital portals to other places and times (one example is the digital Sister Wall, which links to sister cities).
- Communicative building façades: at the street scale and at the sky level.

The street is supposed to act as a "laboratory for testing new products, events, infrastructure, and media, engaging projects with the public, who in turn will experience an ever-changing environment."[20] From the start, the project was intended to push ahead into the future as an experimental development that would reinforce Korea's technology sectors. So far several large-scale components – the World Cup Stadium, power generation, and the public park – have been completed. Currently, 5,000 units of housing and three new schools are under construction and all the major parcels have been sold or leased. Along the DMS, all the infrastructure is in place and ten building groups have been approved, including the following uses: Korean Broadcasting Station, Digital Media Research Institute, R&D Institute Korea Culture and Contents Agency and German Korean Institute.[21]

one-north, Singapore

In 1995, the inaugural Science Hub Steering Committee was formed to generate an innovation ecology (or a creative community) and three guiding pillars were introduced: finance, infrastructure and facilities, and education. This assessment took place at the same time as planners such as the long-time Chief Executive/Chief Planner of the Urban Redevelopment Authority (URA) Mr. Liu Thai Ker were stating that, "We are now talking about the second wave of urban improvement which will be going for quality, variety, excellence in architecture and urban spaces."[22] The Committee began searching for appropriate sites to develop superior zones for innovative research and development.

At the same time, Jurong Town Corporation (JTC), a statutory board under the Ministry of Trade and Industry, was developing a new plan for Jurong West called Jurong Vision 2040.

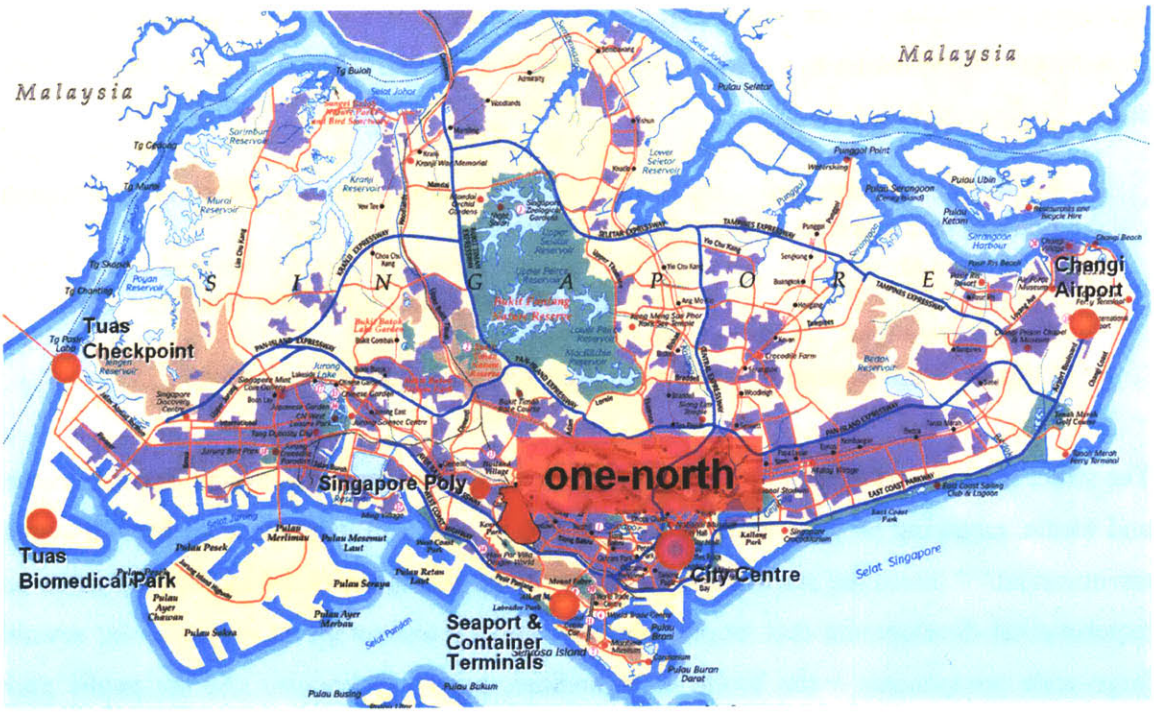

Fig. 2.7 Location of one north in Singapore. Provided by JTC in Summary Presentation, 5th Advisory Panel Meeting (December 2003).

JTC is Singapore's premiere developer, manager and owner of industrial estates and business parks. The quasi-governmental agency owns 38 industrial estates compared to the next largest agency Housing Development Board which owns 13 industrial sites.[23] The group within JTC working on the project advocated for a new planning paradigm moving forward. The Committee heard about the initiative and decided to entrust the small team with another site at Buona Vista (see figure 2.7). JTC was commissioned by the Government to assemble a small dedicated team to lead a masterplanning process and master-develop one-north, then called the Buona Vista Science Hub. For three months, they brainstormed to develop the one-north plan: a center for research and development, education, planning innovation. The conclusion was that Singapore should not develop another science park.[24] Instead the new area should foster a knowledge-based community and produce synergy among and within industry clusters (biomedical, media, ITC). Biotech's need for sophisticated imaging techniques is one example of potential crossover with digital media, for example. ITC was seen as the backbone linking all the potential industries and the term innovation ecology came into use at this time.

In September 2000, the team contacted firms around the world including the USA, Japan and Europe to solicit entries to an open competition for a masterplan. Twenty submissions were made and five were selected. Some of the key characteristics that became decisive in selecting London-based architect Zaha Hadid were: vibrancy of place through street-focused interaction that avoids monolithic towers, which internalize all activities.[25] For approximately one year in 2001, JTC and the Hadid team worked on the details of the plan which has become a dynamic guiding principle.

Five committees or bodies directly influence the project. The Ministers' Committee (Enterprise 21 Committee) is comprised of Cabinet ministers. The Steering Committee is chaired by the Minister for Environment and comprises policy makers from ministries and the heads of agencies – this committee deals with policy issues. The Review Committee is chaired by the JTC Chairman and subsequently CEO and comprises the technical heads of various agencies and ministries – the committee deals with cross-agency and cross-ministry technical issues. The Software Remaking Committee is a project-based, technical group to spearhead experimental projects and policies using one-north as a testbed. The Resource Advisory Panel is an international group of experts who provide feedback and act as ambassadors for the project abroad.

From an implementation standpoint, decision-making at one-north is highly integrated. As the appointed master developer, JTC channels much of the planning process and works particularly closely with three other statutory boards: Economic Development Board (EDB), Urban Redevelopment Authority (URA), Singapore Land Authority (SLA). The three corresponding ministries are Trade and Industry (MTI), National Development (MND), Law (MinLaw). JTC must comply with national planning guidelines set forth by the URA and Land Transport Authority (LTA). However, JTC has achieved a high level of operational independence and flexibility to implement the vision for one-north, which inserts itself into a national project to move Singapore into the knowledge-based era.[26]

The project's scope has been defined as a 182 ha (450 acres) development comprising approximately 3.9 million square meters of mixed-use development (the total size of Singapore is 648 square km). The uses range from residential, institutional, business, to commercial. Once the development is completed (expected date 2015) 73,500 employees will be working and 61,500 residents will be living in the neighborhood. Four principles guide the development:

Fig. 2.8 one-north predominant land uses January 2004. Provided by JTC Corporation, March 2004.

- mixed-use
- constant rejuvenation
- seamless connectivity
- unique identity

The masterplan shown in figure 2.8 calls for an overall site FAR of 2.1 49% of the site is dedicated to open space and roads making the actual FAR approximately 4.2 overall or roughly 3.8 million square meters. (Just for comparison the CBD is 8-9 FAR while the Tanjong Pagar area west of the CBD is 13 FAR.) Each plot has a predominant use that can be supplemented by other uses. Many portions also have "white zoning" which allows any use and demands the highest land prices of all determined land designations (31 possible types) in Singapore.[27] Within the framework of FAR and certain standards JTC is using its flexibility to achieve the best mix of uses and most appropriate densities. Peak areas are located at the heart of three determined and three future nodes called Xchanges. One of the densest areas – Fusionpolis – will reach FAR 10 at the center of Central Xchange above a new transit line (CCL). The overall highest densities are in Vista Xchange within 250 m of the Buona Vista MRT transit station where cultural, social, and business support services for one-north will be concentrated. Several anchor developments including a "high tech" hotel, library, social amenities, retail, entertainment uses and office spaces are in the pipelines. The dense urban elements are counterbalanced by an open space plan whose largest element is a linear park through the center of the site being designed by Dutch landscape firm West 8 and local firm Studio Steed.

The first seven buildings of Biopolis phase I in Life Xchange have been completed and construction on the Nanyang Technological University (NTU) Citicampus and Alumni Club, Fusionpolis and INSEAD Phase 2 expansion are well underway. Two road projects through the site and bordering the southeastern edge have also been started.

Lower Manhattan, New York

The Downtown Alliance is a not-for-profit corporation that manages the Downtown Lower Manhattan Business Improvement District (BID). The organization was founded in 1995 and is financed by a special assessment on commercial properties within the geographic boundaries of the BID shown approximately in figure 2.9 (for comparison to the other cases the World Trade Center site is 6.5 ha or 16 acres). The Downtown Alliance is headed by a Board of Directors which includes property owners, commercial and residential tenants, representatives of the Mayor, Comptroller, Borough President, and City Council. The organization's mission-statement spans community improvement through economic development:

> To create and promote a safe, clean, life-work, totally-wired community, which showcases the nation's most historic neighborhood and serves as the financial capital of the world for the 21st Century. (Downtown Alliance, Presentation held in Seoul, Korea, 23 October 2003.)

The guiding mission statement echoes the ambitious goals announced in the previous three cases. Downtown Alliance is preparing to take advantage of the next upturn in the economy whenever it may occur. In the meantime, urban revitalization initiatives and telecommunications infrastructure upgrades are undertaken because the cost of doing nothing is much too great in

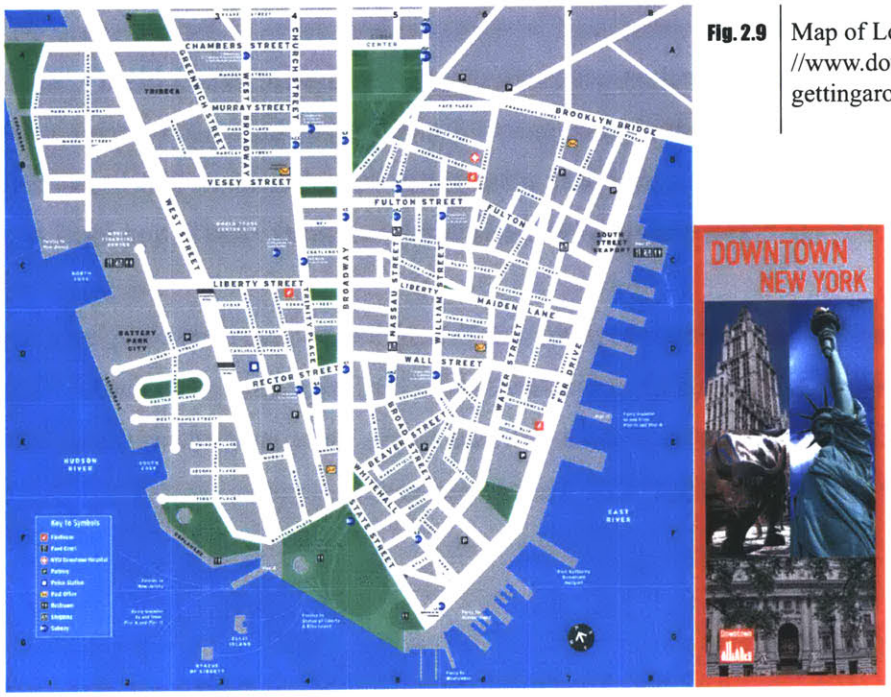

Fig. 2.9 Map of Lower Manhattan. http://www.downtownny.com/gettingaround_map.asp

this high-profile neighborhood.

Several strategies are being employed to realize the goals described in the mission statement. The Downtown Alliance is conscious of supporting commercial retail uses in Lower Manhattan. The organization has also been tracking residential buildings and assisting new residents. The streetscape and waterfront environments are of great concern to the Downtown Alliance, which has developed a document outlining street improvement suggestions. Finally, the organization has focused on providing wireless internet services to visitors, residents and businesses together with the nonprofit organization NYCwireless.[28]

While the Downtown Alliance does not follow a masterplan per se a series of planning documents and design guidelines convey a precise vision for urban development in Lower Manhattan. Setting aside wireless infrastructure for the moment, all of the Alliance's initiatives are currently aimed towards an overarching goal; namely, securing Lower Manhattan's future as a vibrant, mixed-use, around-the-clock community. This goal poses considerable challenges, especially as the Alliance is conscious of reinforcing Lower Manhattan's identity as the world's financial capital.[29]

The "high tech" infrastructure proposed downtown caters to three user groups: residents, visitors and businesses. Initially, special Plug'n Go spaces (pre-wired office) were created downtown such as the 55 Broad Street New York Information Technology Center. Technology business exchange is being promoted by the Downtown Alliance to strengthen the area's identity as a "high tech" zone. For residents and visitors, a Lower Manhattan wireless network is being developed. There are currently seven free wireless internet hotspots downtown. In these WiFi nodes free, high-speed wireless internet access is located. A node is within a five-minute walk from anywhere downtown. More than 63 users benefit from the system per day which exceeds other public networks. During the summer 2003, press covered the Downtown Alliance's work and its outreach activities in parks in the area.

The wireless outreach labs are attempts to foster community downtown through more interaction online and offline. A location-based website or "Splash Page" promotes activities downtown. The "Splash Page" provides the latest information on restaurants, shopping, local attractions and events. This summer, the Alliance is launching a competition for new applications and services that will be available in hot-spots.[30]

A Note about the Methodology and the "Data"

The research methodology consists of collecting comparative case study materials on the evolution of each project from its inception to date. The projects have evolved gradually and only recently have led to physical interventions. As a result, understanding context plays an important role in the case study descriptions. The case analyses are "thick" and selective as a result of data availability and scope of the thesis.[31] I specifically aimed to collect stories from professionals involved in developing these projects.

The four cases introduced in the previous section are not treated as individual chapters to emphasize the similarities and differences among them. The following case discussion weaves the four examples together making the complexities of these technopole projects apparent. The resulting narrative moves roughly from physical project characteristics through strategic and organizational characteristics. Key data points from each case are considered side by side to highlight consistencies and contradictions.

Data points consist of a detailed analysis of available web materials and documentation provided by the organizations representing the projects. In addition, newspaper articles and any available scholarly material (mainly available for Cyberjaya because it is the oldest project) are incorporated into the description and discussion of the cases. On-site interviews as well as telephone and email discussions were held between from January 2004 through April 2004. Site visits provided useful insights into the MSC and one-north. Interviews with representatives from Lower Manhattan and online material provided a good overview of the advanced work being done by the Downtown Alliance. Unfortunately, it was not possible to visit Seoul but first-hand information was available through the MIT-based members of the design research and development team for DMC.

Outlining the Narrative

A narrative guides the reader through the comparative case analyses and suggests several hypotheses about the relationship between hardware, wiring, and software in the chosen examples:

- Hardware indicates the urban built environment.
- Wiring refers to the multiple layers of technology integrated with the plans.
- Software is used as a metaphor for the multitude of actors involved in planning the projects as well as the residents, visitors and employees using the development.

We have reached a stage of development where a binary logic separating neutral spaces of production or global flows (in Castells's terms "spaces of flows") and pre-existing, urban environments (in Castells's terms "spaces of places") no longer adequately describes emerging conditions. This observation leads to a hypothesis about the rescripting of space: *These real estate development projects – called technopoles here – are examples of emerging attempts to recombine flows and places/production and everyday living.*

Telecommunications technologies and location-based services are the preferred systems embedded within the studied environments. These specifically deployed technologies differ from the personal devices urban dwellers tote, but they often work in tandem with the specific systems inserted in the urban realm. And users are already embracing personal devices and systems embedded in the environment such as programmable information displays: *The most effective way to promote better urban spaces with the help of technology is to emphasize the reciprocal relationships users develop with specific technologies over time and to create an enabling environment for experimentation and change.*

These users are also the talent pool economic development experts are trying to attract to the technopoles under development. Without the right mix of firms and employees a cycle of innovation will hardly evolve in any of the projects. However, the pool is limited in number and many cities are competing for the number one position. People are the glue which holds together these developments as they imitate natural urban environments that attract a host of different groups that rub shoulders and interact: *Designing spaces that will initiate interaction for innovation poses a significant challenge for designers who should focus on the possibilities emerging live-work patterns create for better urban environments.*

Together, these three hypotheses guide the narrative which retraces how urban space can contribute to innovation in technopoles through hardware, wiring, and software. Connecting the dots among these three issues provides a more differentiated picture of how technopoles are adding to the urban fabric and what their future roles might be.

(Endnotes)

1 Benko described technopoles as "specialized urban centers:" "The technopole concept also refers to a defined space, a focal point where high technology based economic activities, striving for future innovation, are spatially concentrated." In Georges Benko, "Technopoles, "high tech" Industries and Regional Development: A Critical Review," *GeoJournal* 51 (July 2000): 158.

2 "So the emerging, characteristic pattern of twenty-first century work is not that of telecommuting, as many futurists had once confidently predicted; it is that of the mobile worker who appropriates multiple, diverse sites as workplaces." In William J. Mitchell, *Me ++: The Cyborg Self and the Networked City* (Cambridge, MA: MIT Press, 2003): 153.

3 Jess Gaspar and Edward J. Glaeser, "Information Technology and the Future of Cities," *Journal of Urban Economics* 43 (1998): 136-156. See also, Kyle Eischen, "Working through Outsourcing: Software Practice, Industry Organization and Industry Evolution in India," *CGIRS Working Paper Series*, University of California, Santa Cruz (2004) WP 2004-4.

4 The potential for denser environments might also facilitate more sustainable development patterns that encourage mixed use. Todd Lieberman and Susanne Seitinger, "Adding Lasting Value: Sustainability and Technopole Development," Sustainable Development Conference, World Student Community, www.wscsd.org, (December 2003).

5 Albert LaFarge, ed. *The Essential William Whyte* (New York: Fordham University Press, 2000): 224.

6 The Multimedia Super Corridor encompasses five cybercities that include existing urban areas and new development: Cyberjaya, KLCC (Kuala Lumpur City Center), UPM-MDTC, Technology Park Malaysia (TPM) and KL Tower. Companies that have been accorded with the MSC status have to establish an office in one of these five cybercities.

7 Timothy Bunnell, "A Multimedia Utopia? A Geographical Critique of "high tech" Development in Malaysia's Multimedia Super Corridor," *Antipode: A Radical Journal of Geography* 34, no. 2 (2002): 265.

8 Bunnell, "(Re)positioning Malaysia: High tech Networks and the Multicultural Rescripting of National Identity." *Political Geography* 21, no. 1 (2002): 112.

9 Regulation Department, Multimedia Development Corporation, "Multimedia Super Corridor," Presentation (2003).

10 "Malaysia's Information Ambitions: Virtually Fantastic," *Economist*, Business (1 March 1997): 67.

11 Marc Boey, "(Trans)national Realities and Imaginations: The Business and Politics of Malaysia's Multimedia Super Corridor," Ch. 8 in *Critical Reflections on Cities in Southeast Asia* (Singapore: Times Academic Press, 2002): 193.

12 Cyberjaya homepage: www.cyberjaya-msc.com/page/aboutcyberjaya.html

13 "Shared Services: Engine for Growth" Seminar held by PIKOM Association of Computer and Multimedia Industry of Malaysia, Multimedia Development Corporation, and Malaysia Debt Ventures in Kuala Lumpur, Malaysia, 23 March 2004.

14 Rashid Mat, Marketing Representative, Setia Haruman Sdn. Bhd., Email correspondence, 12 May 2004.

15 The construction of the Bank Negara Data Center will commence in the third quarter of 2004.

16 R.V. Veera, "Visualizing the Jobs for Future," *New Straits Times*, 8 July 2001.

17 Rashid Mat, Email correspondence, 12 May 2004.

18 "Blueprint for MSC Advancement," *New Straits Times,* 15 April 2004.

19 Anthony Townsend, "Digitally Mediated Urban Space: New Lessons for Design," *Praxis* 6 (2004): 104. Professor Dennis Frenchman, Interview.

20 Professor Dennis Frenchman, "Design of the Seoul Digital Media City and Street," Paper delivered at Digital Media City Conference (23 October 2004).

21 Email correspondence with Wolfgang Slawinski, Chairman of the IT& Telecom Committee, European Chamber of Commerce in Korea (25 February 2004) and Professor Dennis Frenchman, Interview.

22 Liu Thai Ker, "Building a Nation," in Ooi Giok Ling and Kenson Kwok, eds., *City and the State: Singapore's Built Environment Revisited,* Institute of Policy Studies (Singapore: Oxford University Press 1997): 110.

23 Ooi Giok Ling, "Planning of the Built Environment and Business," in Ooi Giok Ling and Kenson Kwok, eds., *City and the State: Singapore's Built Environment Revisited,* Institute of Policy Studies (Singapore: Oxford University Press 1997): 108- 131. See also Belinda Yuen, ed. *Planning Singapore: From Plan to Implementation* (Singapore: Singapore Institute of Planners, August 1998): 62.

24 Singapore does not have any natural resources and emphasizes the strength of the country's human capital to succeed in the future. Alain Vandenborre, *Proudly Singaporean: My Passport to a Challenging Future* (Singapore: SNP International, 2003) and Jim Baker, *Crossroads: A Popular History of Malaysia and Singapore* (Singapore and Kuala Lumpur: Times Books International, 2000).

25 Interview with Zaha Hadid after winning the competition. Andrea Tan, "Zero Tolerance for Mediocrity," *Business Times Singapore,* 10 December 2001.

26 I am grateful to Kai Wen Wong for helping me sort out the complexities of Singaporean bureaucracy.

27 Linda Low, "The Political Economy of the Built Environment Revisited," in Ooi Giok Ling, Kenson Kwak, eds. *The City and State: Singapore's Built Environment Revisited,* Institute of Policy Studies (Singapore: Oxford University Press, 1997): 78-107.

28 Anthony Townsend, *Wired/Unwired: The Urban Geography of Digital Networks* PhD Dissertation, MIT, (2003): 127-133.

29 Jordan Silbert, Director of Rebuilding Initiatives, Downtown Alliance, Email correspondence, 11 May 2004.

30 Information about the application prototype contest can be found at www.DowntownNY.com/WiFi

31 Seymour J. Mandelbaum, "Telling Stories," *Journal of Planning Education and Research* 10, no. 3 (1991): 209-214. See also, Nielsen, Eric H. and M.V. Hayagreeva Rao, "The Strategy-Legitimacy Nexus: A Thick Description," *Academy of Management Review* 12, no. 3 (1987): 523-533.

chapter 3
discussing the plans: "hardware"

Project developers face the challenge of translating theoretical ideas about live-work conditions in 21st century post-industrial production models into urban developments. In discussing the "hardware" of technopoles, the chapter focuses on the value added by constructing new, high-quality spaces. The comparative analysis threads together the four projects to highlight the complex task and underscore different approaches. Many of the projects' strengths result from a dynamic and integrated strategy to development. Some contradictions stem specifically from attempting to do too much within the boundaries of one site that is usually treated like an island, separate from the rest of the city. The narrative sets out with site selection, urban context, planning and phasing strategies, urban connections and comes to a close by studying proposed architectural and urban forms. For each example, the thesis discusses how urban form can contribute to the process of innovation. *These real estate development projects – called technopoles here – are examples of emerging attempts to recombine flows and places/production and everyday living.*

The politics of location play an important role because the potential value of the site drives local perception and global visibility. On the one hand, the selected settings reflect city-building agendas. On the other, the projects are sited to attract international investors and especially multinational corporations. Two of the three projects are located on developable land within city boundaries while the Malaysian example is an entirely new town. In all three cases, the projects take on a frontier-like aspect of charting undeveloped territory.

Singapore's one-north covers an area of former British and subsequently Singaporean military camps. In this dense city, open space is at a premium and the sparsely scattered military residences (so-called Black and White houses and apartment buildings from the British military era ca. 1910-1920) make the site appear like a greenfield. JTC is integrating

Fig. 3.1 Typical Black and White houses and apartment blocks located on the future site of one north. Photograph by the author March 2004.

the pronounced topography, which provides a picturesque landscaped background for the development. Even the heritage buildings shown in figure 3.1 blend into the scenery and are more of a landscape feature than additional marketable square footage.

Singapore covets Malaysia's vast open spaces available for expansion. While the availability of land is interpreted as a simplifying factor by outsiders, kickstarting development in uncharted territory is proving challenging in Cyberjaya. The site is located adjacent to the new administrative city, Putrajaya. Urbanization has replaced palm oil fields deemed inappropriate uses within the boundaries of intelligent cities.[1] The 21st century equals urban and Cyberjaya leads the way for Kuala Lumpur to develop further south. As model development proves challenging, places like Penang are reappearing in debates about the future of Malaysia's "high tech" industry. Cyberjaya differs

vastly from the island-city where most Malaysian electronics plants are located.

Like one-north, Digital Media City (DMC) is located on open land within the metropolitan area of Seoul, once the site of the city's sanitary landfill, which has now been completely reclaimed. One of the last large undeveloped sites in Seoul, the DMC is a mixed use large-scale infill development with most of the technopole agenda being realized in the DMC downtown and along Digital Media Street (DMS). Even though the site is under government control, the land has been a challenging development area because it has been reclaimed from a landfill. For years, the city's primary landfill was located between the railway and the river. And the important location on the corridor to North Korea and the new airport means that in the future the site will be the gateway to the city from two directions.

Unlike all the other cases, Manhattan is an existing urban environment that is being retrofitted. Sites for intervention are determined by availability and proximity to other downtown uses. Hotspots, for example, are spread out strategically to be easily accessible for pedestrians. Residential conversions and wired office spaces are developed in available buildings. Unlike the other cases, technopolitan goals are projected onto the existing urban fabric.

The four cases show that bounded, designated sites persist in current projects even though the plans aim to generate continuous urban fabric. The Manhattan case provides a useful counterpoint. If "real" technopoles continue to overlap with large urban centers some of the smaller cities and planned technopoles face considerable challenges towards future growth. Explaining the persistence of siting strategies requires a further exploration of the projects and ties into many other agendas linked to constructing the face of a knowledge-based society.

Even though the DMC and one-north are practically greenfield sites, they are located adjacent to existing, dense urban environments. The case for developing contiguous urban fabric is very believable looking forward. one-north is located near dense housing estates, National University of Singapore and Science Parks I and II. These surrounding uses are campus-like developments so connecting with them will prove an ongoing challenge. Nevertheless the desire to reknit the urban fabric exists. The DMC also tries to create contiguous urban fabric even though the whole Sangam area is a recently developed part of Seoul.

Cyberjaya resembles a new town outside the existing city.[2] The developing country context plays a significant part in this because Kuala Lumpur is fraught with traffic problems,

pollution, and inadequate office spaces. Cyberjaya provides a respite from the hectic chaos of the city.[3]

Creating the right conditions for the evolution of contiguous urban space requires a clear planning approach. The development strategies in Seoul, Singapore and Malaysia break away from traditional models in those cities. Within the boundaries of the projects, most common zoning guidelines are suspended. In fact, one of the most difficult tasks is to shield the respective sites from conventional regulations that would restrict the realization of farsighted vision.

In Singapore, JTC oversees the entire planning process, which traditionally falls under the auspices of the URA. While the URA and LTA still control overall planning measures, JTC develops detailed proposals parcel by parcel. For example, JTC secured a blanket FAR level of 2.1 for the site and is managing the FAR for each parcel independently thus allowing for very precise height controls.[4]

Cyberjaya is located within an exceptional area that was designated the "flagship zone" (CFZ) and falls outside of the spatial logic of the region's other urban areas:

> The MSC's fortress effects also accentuate its detachment from the rest of its urban and national hinterland. Most of the MSC development, with the exception of the KLCC development, are located at least 25 kilometers outside the city of Kuala Lumpur. Putrajaya and Cyberjaya not only function as administrative and technology innovation centers respectively but are also comprehensive land use developments. (Marc Boey, "(Trans)national Realities and Imaginations: The Business and Politics of Malaysia's Multimedia Super Corridor, Ch. 8 in *Critical Reflections on Cities in Southeast Asia* [Singapore: Times Academic Press, 2002], 197.)

The full-service environment is connected by ultra-modern high-speed rail to other special zones that fall out of the existing urban context of Kuala Lumpur. As Bunnell notes, the project is supposed to be insulated to buffer the potential negative impacts of the development and test new strategies that would not be acceptable as blanket national policy.[5]

In their island-like nature, the projects are conceived as focal points for regional economic segments or incubators of emerging industries or both. Seoul has a vibrant "high tech", multimedia sector that spreads throughout the city and several surrounding technology parks. The DMC is seen as a place for this dispersed industry to converge and achieve an international presence in the city. one-north also regroups the country's biotech research labs and media industries that already operate in other parts of the island. In Malaysia, MDC would

like to attract as many firms from the outside as possible while Lower Manhattan is also trying to maintain existing and attract new "high tech" startups – and jobs. The ability to build on existing industry will assist in generating a successful project that is sustainable long-term.[6]

Planning for physical connectivity and circulation pits the special zone approach against the strong desire to build contiguous urban fabric. The projects straddle previous technology park models and their professed urban nature with multiple layers of circulation and transportation planning. Pedestrian, vehicular, and public circulation overlap and intersect in all of the projects.

In one-north, transportation engineers insisted on developing a ringroad within the project. As in past science park projects, a ringroad would provide an efficient access corridor for commercial vehicles to all parts of the site without encouraging unnecessary through traffic. However, the masterplan aims to foster connections and a continuous road network that does not contradict the patterns of surrounding urban areas. After weeks of debate, an agreement for a partial ring road embedded within a street grid was reached. The width of the street ensures smooth traffic flows but inhibits pedestrian circulation. Most of the site is surrounded by wide median-separated urban highways and expressways. The considerable challenge of shifting scales within the site cannot be underestimated.

Within the British housing developments, cul-de-sacs, circles, and curved roads allow a picturesque experience of the site. Again transportation consultants recommended straightening the road. However, JTC planners decided to retain its characteristic meandering identity. The "heritage" road will coexist with wider urban highways integrated into an urban grid. The various circulation systems are intended to provide options for workers, residents and visitors. It is unclear whether that interaction will add or detract from the project's strength. Observing how these compromises lead to desired use patterns will be an interesting element of future studies.

DMS experienced a similar challenge because the main road is arched. Design charrettes in 2002 led to a strong concept (see figure 3.2) hinging on the curved road that flew in the face of transportation engineers, who argued for wide roads and rectilinear geometry asserting cost and safety. The remarkable street traverses a neighborhood organized by a traditional street grid. The design team fought for the central features of the dual concept which has been retained in the masterplan and become the symbol of the project allowing pedestrian as well as

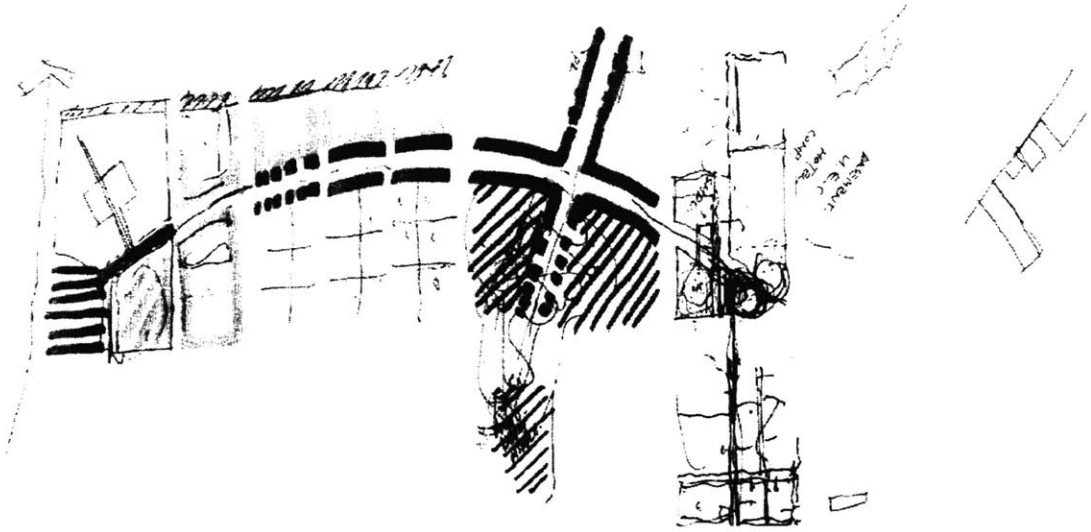

Fig. 3.2 DMC concept sketches collected during design charrette in December 2001. From Seoul Digital Media City Project, School of Architecture and Planning, MIT (May 2002).

vehicular circulation to coexist as they do in most successful urban environments:

> Equally important and more powerful is the introduction of a traditional urban street grid in the area and the linking axes mentioned earlier, instead of one large superblock, with a highway on either side. Also the street widths in the grid was a huge battle – they are now of the Back Bay [Boston neighborhood] variety with street front buildings along the DMS, allowing for cars and pedestrians and environment to intermix – this is unheard of in new Seoul projects that are ALL super-super-super-superblock towers in the park. (Dennis Frenchman [28 April 2004], Comment.)

Connecting cars and pedestrians is very new territory for technopole projects. The desire to retain the efficiency of campus-like systems is evident in all the projects especially in Cyberjaya and one-north. Nevertheless the trend seems to be towards narrower and more connected roads that achieve a true urban feeling.

Unlike most previous planned technopoles, recent projects call for an ecology of uses and typologies that facilitate overlap. While this trend is an interesting evolution in strategy for technopoles and is probably inspired by a more general trend towards mixed use in development practice, the projects manifest the notion of mixed use differently. The layering and choice of uses differs in intensity and dimension (vertical versus horizontal).

Cyberjaya is a sprawling development where residential, commercial and office uses coexist within the same district but rarely on the same parcel. With the exception of the commercial space in Century Square and the Street Mall zone, plots are single-use and a car is

Fig. 3.3 Main intersection in CFZ, view of new construction for expansion of MDC operatoins. Photograph by the author March 2004.

Fig. 3.4 View towards Century Square. Photograph by the author March 2004.

needed to travel from one zone to another (see figures 3.3 and 3.4). Each lot has been designated with specific uses (enterprise, commercial, residential, and mixed) in the masterplan and so far no significant amendments have been made to the initial land-use plan.[7]

At the other extreme, one-north is implementing vertical and horizontal mixed use. Each plot has a predominant land-use that is supposed to be supplemented by other components.[8] JTC uses the slogan "live – work – play – learn" to describe the type of mixes it would like to achieve.

The DMC has less vertical overlap but all the zones include living and working elements. The low-rise end of the development is predominantly housing while the high-rise neighborhood includes office, some multi-story residential buildings, hotel and entertainment

uses.

In Lower Manhattan, the desire to generate a 24/7 community is driving the mixed use strategy. In the 1990s, housing was seen as the missing link to fostering a vibrant urban atmosphere. When Downtown Alliance was founded in 1995, lower grade commercial office space was increasingly vacant and residential uses were seen as a way to rehabilitate buildings. While other places around the world attempt to imitate Manhattan, the downtown area itself is trying to reinvent itself as an urban space. Based on this logic, single-use developments like Battery Park City (which is almost entirely residential) could be challenged for introducing a suburban logic into a paradigmatic urban space. In the emerging technopole model, a "high tech" environment needs the messiness of urban space to generate the stimuli that support innovation and economic development in turn.

Fig. 3.5 Biopolis from Wessex Photograph by the author March 2004).

Overlapping uses are believed to generate the diversity and mix necessary to spark innovation:

> Spatially, to support this 3C community [computing, communication, creative sectors], the dynamic mixed use planning approach has been applied with a tri-partite focus – to co-locate business-industry with research and education. Supporting this 'tri-partite work core' will be residential developments and recreational amenities to form a complete industry ecosystem. (JTC, "A New Workplace for a Creative and Technologically Savvy Community," Resource Advisory Panel Meeting [12-13 December 2002], Issue 1.)

The ecosystem is assumed to be dense in all cases as JTC plans for intense levels of intellectual and economic activity. The masterplan in Singapore calls for an FAR of 2.1 overall on the site. 50% of the site is to remain open leading to a de facto FAR of 4.2. Preservation efforts in the three heritage zones Wessex Estate, Nepal Park, and Rochester with very low density (FAR 0.75) are juxtaposed with high density zones (FAR 10) in Fusionpolis, which exceeds parts of the CBD area. The contradictory logic of high-rise, canyon landscapes and low-rise park landscapes (figures 3.5 and 3.6) shows how difficult it is to resolve the need for density in

urban form, which the proposed 100-story tower near the park in the DMC also attests.

Fig. 3.6 Image of Biopolis under construction. Photograph by the author March 2004.

In contrast, Cyberjaya continues in the footsteps of planned technopoles like Sophia Antipolis. The open space ratio (49% of all developable land) and plot development restrictions described in Chapter 2 are extremely stringent. These regulations are a clear signal that the chaos of the existing Kuala Lumpur CBD is not desirable in the "high tech" haven of Cyberjaya. The "Silicon Valley of the Tropics" emulates more traditional science parks around the world.

In resolving density issues to achieve critical mass of firms and residents, the plans balance urban space with park land in interesting ways. In Seoul, Singapore and Malaysia, significant open spaces are integrated with vibrant urban pockets. Downtown Alliance has developed strategies for streetscape improvements, but open space is much scarcer in the high-density area and generally concentrated on the waterfront.

Cyberjaya and one-north include large park spaces, which are difficult to develop successfully in tropical climates where most people avoid the outdoors and especially direct sun. The 40-acre Lake Garden Park in Cyberjaya is used by weekend visitors for picnics and recreation in the late afternoons and evenings. It is located on the periphery of the flagship, phase I area and does not feel integrated with the remaining development. Workers do not seem to use the space regularly either. Interestingly, Cyberjaya was just awarded the National Landscape Award for the third consecutive year:

Fig. 3.7 | Cyberjaya pocket parks. Photographs by the author March 2004.

> The development concept of Cyberjaya "Where man, nature and technology" has been verified once again when this fledgling city won the National Landscape Award during the National Landscape Day celebrated today.
>
> The best landscaped Community Park award was given to the Cyberjaya community park that was located across the street from Street Mall. This is the 3rd consecutive year that Cyberjaya development received the top prizes in the nationwide competition. In 2003, Taman Tasik Cyberjaya won the Community Park category whilst in 2002, the honor went to the Street Mall (Commercial Building category) and Cyberview Lodge Resort & Spa (Hotel/Resorts category)
>
> The award was given out by Dato' Seri Ong Ka Ting, Minister for Housing and Local Government. The date 3 March has been set as the National Landscape Day every year and state-level celebration and activities continue throughout the month. The ministry, under the National Landscape Department, aims to achieve its vision for Malaysia to be a Garden Nation by 2005.
>
> Under the Development Guidelines for Cyberjaya, strict criteria was laid down with regard to the landscaping of the whole city. This is consistent with the low-density building, resulting in an expansive and soothing environment. ("Third Consecutive National Landscape Award," *Cyberjaya Online News*, 3 March 2004, http://www.cyberjaya-msc.com/cgi-bin/news.cgi?action=display&id=1078784757)

And the quality of the landscaped space certainly is high even though it may not be used as heavily as projected. A smaller pocket park near the Street Mall and the green spaces at the center of Century Square will probably be used more frequently (figures 3.7 and 3.8).

Singapore has taken a different approach to integrating its large open space; a linear park proposed by Dutch firm West 8 and local firm Studio Steed connects through the site as a recreational haven. The irregular schedules of knowledge workers require easily accessible open space that accommodates the tropical climate. one-north is dotted with pocket green

spaces that will serve as resting places for these workers as they are catering to construction workers at the moment. These spaces break up the canyon landscape within the Biopolis area and will undoubtedly contribute to the quality of the workplaces. The existing conditions on the site are very lush and many old trees remain within the area. Ironically, trees are being relocated within the site while new development takes over their previous habitat (see figures 3.9 and 3.10). Using sophisticated strategies large, existing trees are being relocated within the site, on the one hand. On the other, some existing structures will be demolished to make way for the linear park, which runs diagonally through the center of the site. Open space protection guidelines recreate the park-like effect after it has been displaced by asphalt and new parks reclaim built-up land.

Fig. 3.8 Green space at the center of Century Square. Photograph by the author March 2004.

The green spaces within the development are impressive but they are only a shadow of the contiguous open space that is the legacy of the British military housing area. However, the existing environment has already been groomed and preserved as the open grasslands show (figure 3.11) as in a tropical environment,

Fig. 3.9 Central plaza at Biopolis. Photograph by the author March 2004.

Fig. 3.10 Typical pocket parks dot the landscape of Biopolis, one of three planned hubs in the planning or construction phase. Photograph by the author March 2004.

it is impossible to maintain open grassland without care. The competing logics of different constructed landscapes are battling it out on the site and over the long term a new unified logic of linear parks and pocket parks will take over from the colonial landscape.

The open space plans (for example see figure 3.12) are often used to claim an ecological agenda for the project. Cyberjaya is where "man, nature and technology live together in harmony." one-north is also trying to preserve the existing lush landscape and includes references to tropical architecture, a style that accommodates the hot and humid climate (see figure 3.13).[9]

Fig. 3.11 Grassland area in Wessex Estate. Photograph by the author March 2004.

These features seldom result in green buildings for budgetary reasons though the architectural language of brise-soleil and shading is used in Biopolis. Cyberjaya also espouses green agendas but like one-north feasibility studies have prohibited the development of any green buildings so far:[10] One notable exception is a district cooling system at one-north within the

high-density hubs to cut down on energy costs.

In Seoul, the creation of a large-scale urban park also represents an environmental breakthrough because the site is reclaimed from a landfill. In fact, phase one involved rebuilding the hillside to stabilize the ground. A huge urban park now serves the whole region with over 1 million trees planted and a sophisticated infrastructure providing methane power. On weekends, thousands of people are drawn to the park and it will remain to be seen whether these recreational users also flock to the experimental open spaces within the DMC.[11] The rendering in figure 3.14 shows a rendering of the large park.

Top **Heritage buildings will be preserved and redefined as part of the new landscape.**

Far right **Trees are preserved and plot ratios ensure green spaces bring peace, calm and a new kind of vibrancy to one-north.**

Fig. 3.12 | Open Space Plan for one north. JTC Brochure.

Fig. 3.13 Building façades on first phase of Biopolis. Photograph by the author March 2004.

Fig. 3.14 DMC Aerial Rendering. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003).

The mix of uses and stringent open space requirements necessitate appropriate phasing strategies to achieve a critical mass of residents and firms (for example see figure 3.15). Some of the phasing strategies are based on seeding a core zone and growing outwards in concentric rings like in Cyberjaya. In Singapore, JTC made a conscious effort to develop several nodes or Xchanges simultaneously. The dispersed strategy requires higher up-front infrastructure investment. As the land area affected in Cyberjaya greatly exceeds the project size in Singapore, the resulting development pattern feels disjointed even though it is focused within an area.

These planned technopoles emphasize urban design and a vibrant city fabric over singular architectural statements. In Seoul, a major broadcasting company wanted a building complex all to itself. The masterplan would have allocated two sites on either side of the cultural spine to the company within the heart of the

multimedia hub. However, the company did not want to split its operations, preferring a more conventional campus within the project. After much negotiation, including threats to move elsewhere, MBC, the largest broadcasting company in Korea has agreed to and now embraces the original proposal, and will be integrated with the urban fabric. As described earlier, the spine links from the train station through the heart of the media/cultural and broadcasting district to a local high-school and major residential south of the DMS. The high density media district is located next to a commercial office district that includes a 100 story building that will be one of the world's tallest buildings.[12]

The first seven buildings in Biopolis in Singapore do not express a corporate identity. Five of the seven buildings house government research agencies headed up by A*Star under Philip Yeo.[13] It will be interesting to study how the private sector firms choose to adapt their spaces within the two multi-tenant structures. So far the project has emphasized good design over signature buildings. The existing Ministry of Education building stands in stark contrast to the adjacent Biopolis area where high quality design is an obvious emphasis.

> The government is staking the future of the city-state on creating a global niche in the biomedical sciences, infocomm technology (ICT) and media industries. Architecture will inevitably be an integral part of this process of reinvention. (Robert Powell, "View from Singapore," *Architectural Review,* no. 26 [March 2002], 37.)

The NTU City Campus and INSEAD located nearer to the Fusionpolis hub have constructed signature buildings that are solely dedicated for their use. These developments are interlinked with the project of constructing satellite campuses and visible identities for the universities.

Like NTU and INSEAD, most of the organizations and companies locating in Cyberjaya are larger operations and are seeking to increase their visibility. With the exception of two multi-tenant zones, the companies have developed their own buildings. In the case of Ericsson, the company launched an invited, international design competition. The resulting building is more elaborate than some of the other turnkey developments within the flagship zone. In all cases, though, the buildings are contemporary architectural styles and thus differ significantly from the mogul-inspired buildings of the adjacent administrative capital Putrajaya.

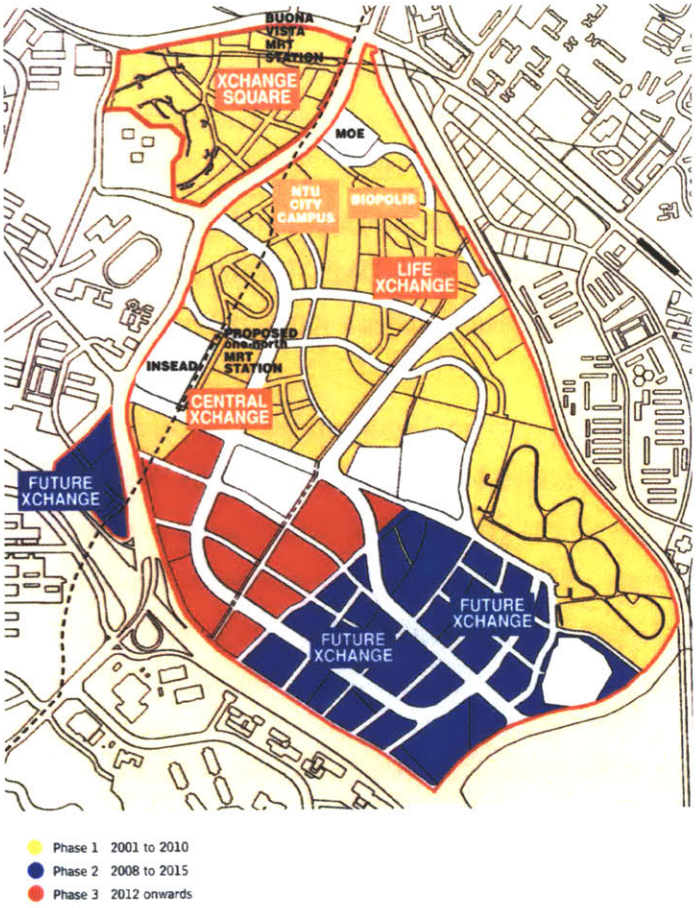

Fig. 3.15 Phasing plan for one north. From JTC, "The Future is Imagination," Informational brochure for one-north.

The places being developed in Cyberjaya, the DMC and one-north attempt to be real places that fulfill local needs and correspond to the needs of post-industrial production networks. Consciously or unconsciously, project developers are aiming for these goals by emphasizing the quality of the urban realm and the benefits from inhabiting these environments. Equally prevalent is the desire to propose forms that will be recognizable and recognized as the project evolves. In Seoul and Singapore especially the proposed urban and architectural forms are designed very carefully with the desire to impress an image upon viewers. And the image represents urban form rather than signature architecture as with the distinctive Hadid masterplan.

(Endnotes)

1 Timothy Bunnell, "A Multimedia Utopia? A Geographical Critique of "high tech" Development in Malaysia's Multimedia Super Corridor." *Antipode: A Radical Journal of Geography* 34, no. 2 (2002): 284.

2 New town planning in Malaysia is an inheritance from the British urban development tradition, which has a continuous history.

3 Anecdotal evidence from friends suggests that people with cars do travel to Putrajaya and Cyberjaya to relax on weekends by driving around on broad, clean streets.

4 Vince Chong, "Flexible Zoning to Be Applied at one-north," *Business Times Singapore*, 5 December 2001.

5 Tim Bunnell, "(Re)positioning Malaysia: "high tech" networks and the multicultural rescripting of national identity," *Political Geography*, 21 (2002), 105-124.

6 U.S. newspapers have recently been discussing outsourcing regularly since the beginning of 2004. For example, see Thomas L. Friedman, "The Secret of Our Sauce." *New York Times*, 7 March 2004 or *Wired Magazine*. February 2004.

7 Rashid Mat, Marketing Representative, Setia Haruman Sdn. Bhd., Interview, Cyberjaya, 24 March 2004.

8 Singapore does have a precedent for vertical mixed use in other parts of the city. Orchard Road for example is shopping malls and offices stacked above. Some of the housing estates have first-floor retail.

9 Robert Powell, "View from Singapore." *Architectural Review* 26 (March 2002): 36-37.

10 Singapore/Malaysian architect Ken Yeang developed a systemic and aesthetic model of the Tropical City. He describes the two aspects in the following way: 1) "...as a systemic model, it provides a bio-climatic basis for the design of the city and its systems. Here, the beneficial use of climate is adopted as the town planning criteria for a 'low-energy' city and one that would encourage an urban environment which is integrated by its landscape." 2) "...as an aesthetic model, the metaphor provides a vision for the shaping of buildings and urban spaces, conjuring up the image of a luxuriant 'tropical urban garden' and an open way of life." In Ken Yeang, "The Tropical City," in *Rethinking the Environmental Filter* (Singapore: Landmark Books, 1989): 100-105. See also, Liu Thai Ker, "Towards a Tropical City of Excellence," in *City and the State: Singapore's Built Environment Revisited.* (Singapore: Oxford University Press, 1997): 31-43.

11 Dennis Frenchman, Interview.

12 Ibid.

13 Alain Vandenborre, *Proudly Singaporean: My Passport to a Challenging Future* (Singapore: SNP International, 2003): 39.

chapter 4
understanding the use of technology: "wiring"

As the urban "hardware" is designed and developed, parallel IT masterplans evolve in support of those urban spaces, which has been identified by Mitchell, Townsend, the DMC research team and others as a unique opportunity for enhancing urban life.[1] In all the projects, using technology in urban environments proves challenging both for lack of precedents and rapid change of available systems and devices. With the exception of wireless and broadband connectivity, most of the project designers do not provide detailed information on how technologies will impact the urban realm, not least because they are pushing the envelope into unexplored territory. With the notable exception of DMC, it is difficult to ascertain a unified vision of "smart" urban space from the available project specifications. In Seoul, the Korean Institute of Science and Technology (KIST) and MIT researchers developed a taxonomy for systems available tomorrow.[2] The project emphasized immediate implementation, which was a key driving force behind the research. The thesis argues that technopoles are unique opportunities for testing personal devices and embedded technologies; and they could be leading the curve within an urban region. *And the most effective way to promote better urban spaces with the help of technology is to emphasize the reciprocal relationships users develop with specific technologies over time and to create an enabling environment for experimentation and change.*

Five categories outline how technology is used for different purposes in the four case studies:

1. broadband and wireless telecommunications technology
2. location-based services and applications (usually coupled with WiFi hotspots)
3. digital display surfaces at various scales
4. "smart" urban management systems
5. superior research facilities

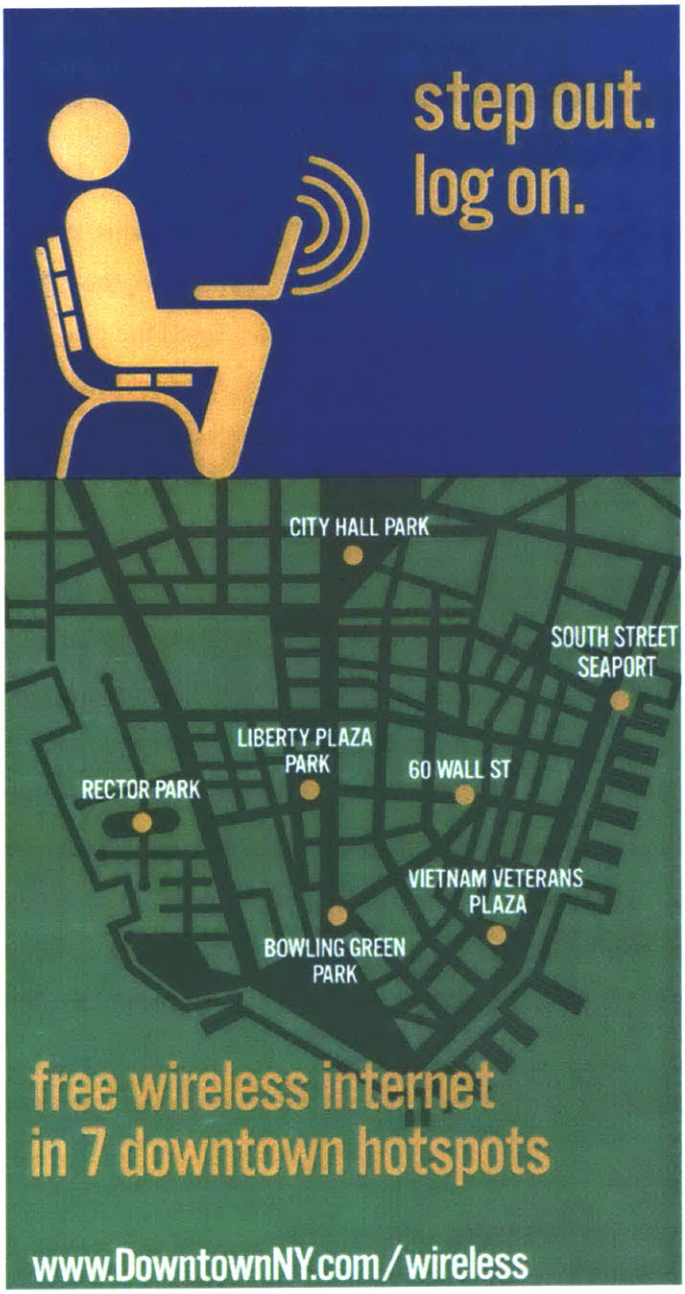

Fig. 4.1 | Downtown Alliance WiFi flier. Downtown Alliance (Spring 2003), www.downtownny.com/wireless.

The first three categories shape the urban experience for employees, visitors and residents while the last two are more important for image value and attracting firms. The technology could also be sorted by themes like movement, place information or transactions, three of the categories proposed for the DMC.[3] In contrast, the following discussion focuses on which technologies are being implemented and then infers preferred uses and themes. This conscious choice was made to develop an accurate picture of which technologies are actually finding their way into built environments. The goal here is not to catalogue technologies but to show which elements and thus uses or applications are being emphasized. Clearly, telecommunications technology and location-based services are the preferred directions so far.

First and foremost, providing a backbone for broadband connectivity throughout the developments and by extension wireless (Wireless Local Area

Networks or WLAN) is emphasized in all of the projects. Project scale and development context determine how successful a telecommunications strategy can be and what additional features it supports. The uses for fixed-lines and wireless connections range from public to private and enable a range of potential interactions.

The most striking telecommunications initiative can be retraced in Lower Manhattan. Since September 11, the area has been striving to demonstrate the superiority of the telecommunications network there.[4] The attacks conveyed a negative impression of the resilience of the telecommunications infrastructure available downtown even though the level of investment in the 1990s was extremely high and the existing network was far superior to most other urban areas. A blue-ribbon task force involving major telecommunications operators downtown developed a series of proposals for reinstating Lower Manhattan as a hub. The team produced *Building a 21st Century Telecom Infrastructure: Lower Manhattan Telecommunications Users' Working Group* in August 2002 which recommended the public WLAN initiative stating that "the network not only provides a tremendous benefit to area employees, but it also raises Lower Manhattan's profile as an area for companies serious about telecommunications."[5]

WLAN initiatives are one visible strategy for representing telecommunications infrastructure in urban spaces. Passers-by receive visual cues that connectivity is available when users access their laptops and other devices in public spaces. Generating a debate around wireless nodes serves to instill confidence in potential residents and businesses that Lower Manhattan's telecommunications infrastructure is up to date. And today, downtown is recognized as the premiere wireless network in a major urban space in the world. Parallel developments in other cities cite the Downtown Alliance's work as a model for deploying similar nodes.[6] Since the first hotspot was initiated in 2002, six additional hotspots have been created and will be in operation during the summer 2004 as shown on the flier in figure 4.1.

Fig. 4.2 Access point in window of Ulysses restaurant on Stone Street in Lower Manhattan, which was recently renovated thanks to the initiative of business leaders in the area. Photograph by author April 2004.

A non-profit organization, NYCwireless, provided

service using WiFi technology in the first free hotspot in New York City and now a small firm, spun out from the nonprofit and called Emenity, provides service to the business improvement district (BID) under a contract to install and maintain access points (see figure 4.2). The nodes in Lower Manhattan are attached in locations that allow signals to cover the targeted public spaces like Stone Street shown in figure 4.3. They are not visible and fliers and information campaigns alert potential users.

For firms locating downtown, the Alliance is attempting to implement a plan for wireless redundancy loops to New Jersey and Brooklyn from the roofs of the tallest buildings. In the case of a terrestrial attack, these systems would compensate for loss in service and backup data.[7] Less visible than public initiatives, this idea has already been implemented by some private firms (Goldman Sachs, for example) and recommended by some real estate developers such as the Rudin Management Group, which also developed the New York Information Technology Center at 55 Broad Street in Lower Manhattan.[8]

Expanding on attempts to provide certain services in Lower Manhattan, DMS approaches infrastructure for wireless connectivity from an urban design perspective that visually expresses where hotspots are located. The entire DMC downtown will have wireless access as basic infrastructure.[9] DMS places antennas and emitters on a prototype street element (figure 4.4) that doubles as an intelligent light fixture. Available at various scales, the light adjusts to required activities and acts as a conduit and sensor for information up and down the street. Additional features such as shading and solar-power are also under consideration. The research team recommended financing the prototype with public or private dollars. So far it is not clear whether that will take place.[10]

Fig. 4.3 Stone Street in Lower Manhattan. Photograph by author April 2004.

In one-north and Cyberjaya, wireless and broadband connectivity are assumed throughout the project though no specific fixtures have been proposed. Currently, three

public WiFi hotspots exist within Cyberjaya at Street Mall, Cyberview Lodge, and Century Square. Based on limited first-hand site visits it is difficult to estimate usage. Anecdotally, there is some evidence that the service is valued, however, it seems unlikely that the number of users will grow significantly in the short term because of accessibility limitations.[11] Broadband is available to office complexes, which was a key selling point in the early stages of development, though, has become less important as country-wide systems improve.[12]

Telecommunications infrastructure has also improved significantly in Singapore in recent years. Therefore, broadband, wireless, and mobile telecommunications are available throughout most of the island. Opening the site to an array of providers gives future tenants the option to select a competitively priced package. However, one-north will not be able to distinguish itself from other locations by providing superior telecommunications infrastructure unless special services are added to the offer.

The true power of these wired and unwired telecommunications services lies in their influence on the city's metabolism which is suddenly "coordinated on the fly in real time."[13] In this environment, urban dwellers coordinate their lives as they go and require additional services attuned to their geographic position. These applications and services are grouped under location-based services enabled by mobile communications and wireless connectivity. Some real estate developers are attempting to capitalize on a new market niche

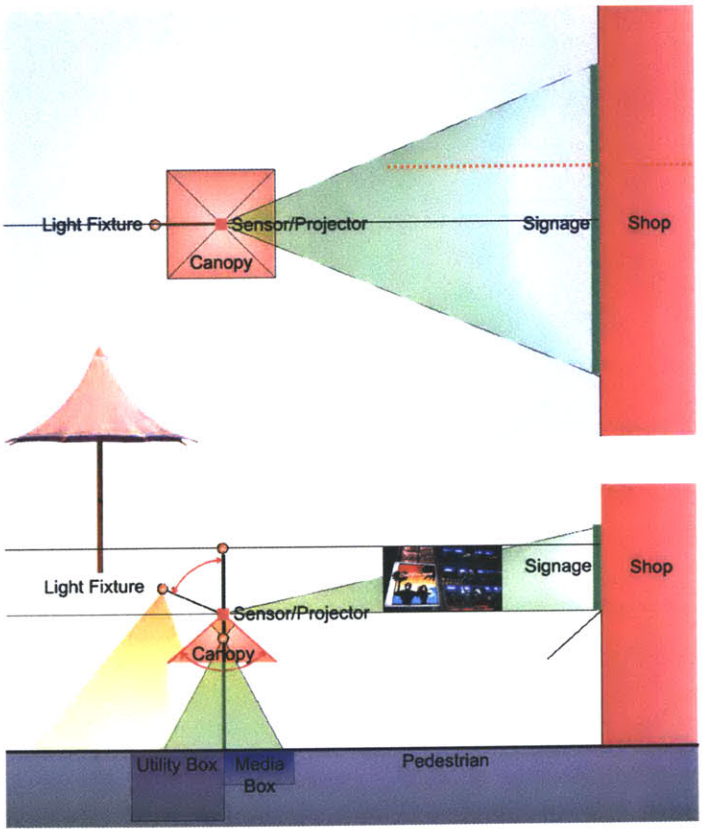

Fig. 4.4 DMC Streetlight. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003).

by latching these services onto more traditional development products.[14]

Second, location-based services and applications provide specialized content accessible from hotspots setting a precedent for what should ultimately become zones for "anydevice" anywhere, anytime. Brought on by mobile telecommunications technology and extended into WiFi enabled devices, location-based services respond to geographic triggers such as the location of a user. Content is generated that specifically responds to a person's geographic context and can be queried to request more precise answers.

In 2003, Downtown Alliance created a Splash Page to provide an online exchange for community information and interaction. The page is a portal to the free wireless network and introduces users to sponsor organizations. The site links to information on the downtown area: events, eating out, shopping, and local attractions. Under the motto "step out. log on.", Downtown Alliance has built one of the most heavily used hotspot networks existing today.[15] Access points attract 50-60 users per day while the typical Starbucks access point is only used by two to three people. Even hotspots in Amsterdam Airport Schiphol are only used by an average of twelve people per day. The first free hotspot sponsored by NYCwireless was in Bryant Park, New York (see fig. 4.5 for Union Square Park) and achieved an average of 32 users per day in the summer 2002. The current success rates downtown attest to the fact that these services are used and

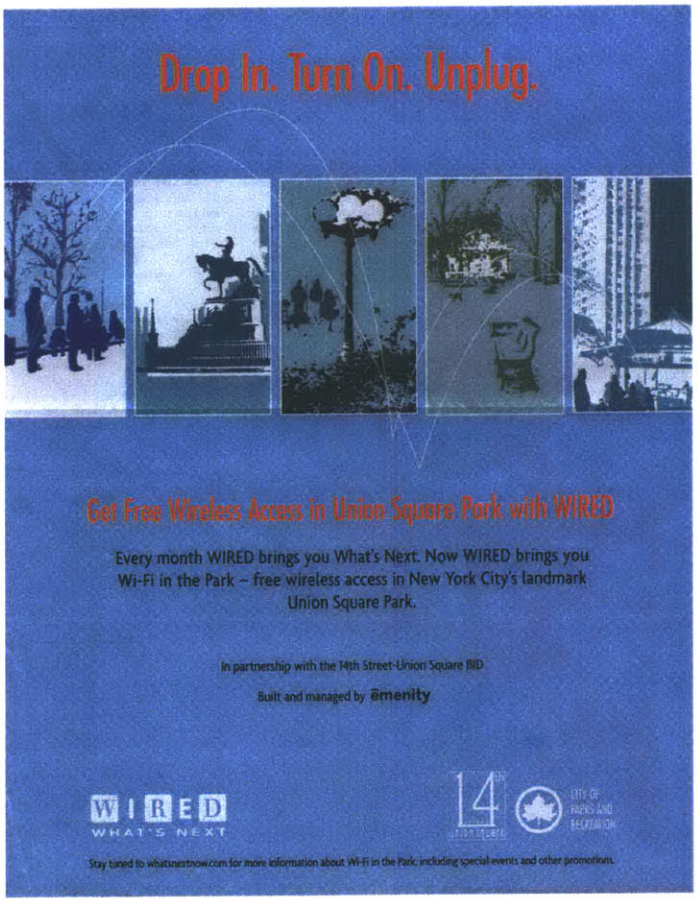

Fig. 4.5 Advertisements published by CondéNast Magazines. From New Yorker Magazine, Fall 2003.

Fig. 4.6 These renderings show how façades could serve individual retailers and coordinated public purposes on the Digital Media Street. The top image shows the façade in use by individual retailers and the bottom image shows the façade during a festival. Drawing by Professor Dennis Frenchman, MIT and Lining Geng of Digital Media City research team. Shown at DMC Presentation, Seoul, Korea (23 October 2003) and included in Anthony Townsend, "Digitally Mediated Urban Space: New Lessons for Design," *Praxis* 6 (2004): 100-101.

Fig. 4.7 This diagram shows how the façades at street level and for the whole building would be managed in Digital Media City. From Dennis Frenchman, DMC Presentation, Seoul, Korea (23 October 2003).

appreciated by certain communities, especially in dense urban areas.[16]

Moving forward from the Splash Page, the Downtown Alliance will launch a competition during the summer 2004 to elicit ideas for an application prototype that will draw more attention to the WiFi hotspots.[17] At the moment, the login-page does not offer any specialized services and applications. To sustain its identity as a dynamic business district, Downtown Alliance believes that Lower Manhattan will benefit from offering some applications on its network that build and reinforce its community.

Third, digital signage plays an important role in some of the projects. In DMC, stores and companies must install digital billboards that are addressable.[18] This feature would allow for coordination of façades on special festival days or during certain times. Private owners would be required to contribute their space for certain activities throughout the year to achieve moods like the one shown on the rendering (see figure 4.6). In order to switch from a coordinated use of the signs to individual displays, the façades are all addressable and digitally programmable. Special zoning design guidelines (figure 4.7) dictate the types and locations of displays allowed at the pedestrian scale, which raises difficult issues of content management and balancing public and private priorities. The design of the upper portions of the buildings – with the exception of the top – are unregulated to encourage a mix of displays. one-north is considering similar options for the media hub at the heart of Central XChange, but so far they have not proposed any specific configurations.

Fig. 4.8 The Cyberjaya Smart Command Center is intended to act as a coordinating center for the utilities serving the entire development when the park reaches higher capacity. Photograph by author March 2004.

Fourth, several projects incorporate "smart" features in their planning, operation, and buildings. Integrated urban management systems are proving difficult and costly to implement. Mentioned in most of the projects, these systems are difficult to bring online and the smart building systems are usually limited in scope.

In Cyberjaya, the vision for a smart city emphasizes urban systems and building management. The government developed a command center (figure 4.8) to control all city systems centrally in the future. Until a critical mass of development is reached the command center will most likely not be in operation. The large scale of the development and the high cost of common services tunnels and integrated utilities systems are prohibitive.

Several developers, especially SHSB, have incorporated smart homes features whose systems are controllable via internet in an integrated fashion. For the most part, these systems allow access to HVAC controls which can be very useful in the hot and humid climate of Malaysia. So far SHSB has successfully marketing these homes in various developments including The D-Melor Condominiums shown in figure 4.9.[19]

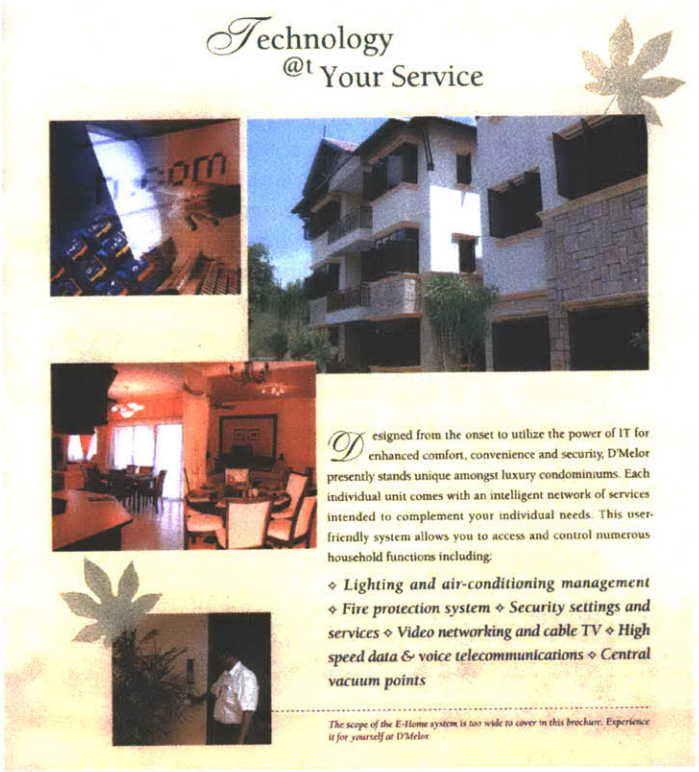

Fig. 4.9 Smart homes in Cyberjaya: D'Melor and the Promenade Lakeside. Excerpts from promotional material prepared by master-developer Setia Haruman for D'Melor, Cyberjaya and The Promenade Lakeside housing developments.

DMC has proposed a traffic management system that is going to be tested on the street for traffic signals, signs and markings as well as real-time information on parking, buses and taxis. These features will assist in distributing traffic more efficiently and allowing users to reach their destinations more rapidly. The goal is to efficiently integrate pedestrian and public and private vehicular traffic.

The last group of features available falls under the category of advanced research facilities. While superior telecommunications infrastructure attracts some firms and residents, R&D centers are more specialized and can be very effective incentive strategies, especially

Fig. 4.10 Two renderings showing how an ambient information system could announce the arrival of the underground at Kendall Square in Cambridge, MA. Several bricks have been replaced by intelligent elements that would change color as the train arrives in the station underground. Meanwhile travelers in the train would be watching taped video feed of the landscape above ground to enhance their experience of the city. Reprinted with permission from Panagiotis Chatzitsakyris, Gonçalo Ducla-Soares, and Alejandro Zulas. "IN-Visible: Perceiving Invisible Urban Information through Ambient Media," CHI 2004 Vienna, Austria (24-29 April 2004).

within the biotech industry where costly facilities may be required. In one-north, JTC is making a concerted effort to market shared lab space and testing facilities to biotech firms. A super grid computing facility is also intended to attract imaging as well as biotech companies. JTC believes that these facilities will attract firms and create spaces for interaction across industries.

Telecommunications and location-based services are the two most important strategies being implemented in the technopole cases. Both of these directions emphasize the reciprocal relationship between users and technology in a way that is uniquely urban.[20] It is exciting to observe this trend as it should lead to interesting results in the future as more and more users make use of the technologies to fulfill unpredictable needs. An emergent trend identified in the DMC is the blurring of public and private space within the city as the public realm becomes appropriated for private uses.[21] Conversely, private spaces – such as the advertising panels along the media street – can be converted to public uses more easily at certain times.

In further support of an enhanced urban environment, DMC's attempt to integrate urban design with certain technologies indicates a very productive direction. In the future, initiatives like Downtown Alliance's 1999 Streetscape Initiative for Lower Manhattan[22] could be integrated with planning for enabling environments for emerging technologies. Examples from two recent student projects at MIT involve the display of information through ambient media and other display systems (figures 4.10 and 4.11).[23]

An innovative approach to the Downtown Alliance's streetscape initiative today would

ensure that the proposed systems do not counteract each other and are flexible enough to accommodate emerging technologies. Acknowledging the controversial implications of too much technology in the built environment and questions of appropriate levels of access and protection, several productive directions should be explored to harness the energy apparent within this field.

Fig. 4.11 Moving Audience" project from Fall 2003 Cannes workshop. Reprinted with permission from Lira Nikolovska, Ph.D Student in Design and Computation, Department of Architecture, MIT..

(Endnotes)

1 Anthony Townsend writes "...urban space is now the unique stage for experimentation with new lifestyles based on digital network connectivity. Because cities have remained vital despite the rise of digital networks, and because these networks have generally not been deployed outside major urban areas, there is a great opportunity for urban design to leverage this new infrastructure to create more unique, livable urban spaces." In *Wired/Unwired: The Urban Geography of Digital Networks,* Ph.D. diss. (MIT, 2003): 138. Graham and Marvin predict similar opportunities: "Telecommunications provide new potentials for exploiting space in new and innovative ways. The new advanced telecommunications infrastructures are not simply ubiquitous and available everywhere at the same costs. Instead, they are unevenly developed; not all users have access to the network and this access varies in cost and quality." In *Telecommunications and the City* (London and New York: Routledge, 1996): 335.

2 Dennis Frenchman, "Media Street Elements, Guidelines, and Illustrations," Working Paper (MIT) 27 January 2003.

3 The categories proposed were: (1) maintenance, (2) movement, (3) place information, (4) transactions, (5) communications/meeting, (6) events and entertainment. See, Dennis Frenchman, "Media Street Elements, Guidelines, and Illustrations," Working Paper (MIT) 27 January 2003.

4 Jordan Silbert, Director of Rebuilding Initiatives, Downtown Alliance, Interview on 16 April 2004.

5 Jordan Silbert, Director of Rebuilding Initiatives, Downtown Alliance, Interview on 16 April 2004 and "Building a 21st Century Telecom Infrastructure: Lower Manhattan Telecommunications Users' Working Group" in August 2002, 8.

6 Downtown Alliance participated in the Digital Media City conference in Seoul, Korea in October 2004.

7 "Building a 21st Century Telecom Infrastructure: Lower Manhattan Telecommunications Users' Working Group" in August 2002: 6.

8 Rudin Management and the New York Information Technology Center at 55 Broad Street, www.55broadst.com.

9 Professor Dennis Frenchman, Interview.

10 Professor Dennis Frenchman, Interview and "Media Street Elements, Guidelines, and Illustrations," Working Paper, 27 January 2003.

11 Based on anecdotal evidence, some residents from KL check their email at Street Mall but the destination seems to be valued for its refuge-like characteristics rather than for being in a popular area.

12 Based on conversations at "Shared Services: Engine for Growth" Seminar held in Kuala Lumpur, Malaysia 23 March 2004.

13 Townsend, *Wired/Unwired* (2003): 125.

14 Anecdotal evidence from the Boston area indicates that real estate developers working the life-sciences industry seem to be leading the curve here.

15 Townsend, *Wired/Unwired* (2003): Figure 6.5.

16 Obviously, these spaces do not address fundamental access issues. Projected users all have laptops and other WiFi enabled devices to allow them to take advantage of the hotspots. Statistics from Economist.com, 26 June 2003 http://www.economist.com/business/PrinterFriendly.cfm?Story_ID=1883109 See also, Townsend, *Wired/Unwired* (2003): 129.

17 For more information on the competition see www.DowntwonNY.com/WiFi

18 Many cities have active signs now announcements and updates on traffic, public transport, parking, availability, weather, etc. "LED Message Reader Boards: Town Criers of the Modern Age," Signindustry.com: The Online Magazine for the Sign Industry, www.signindustry.com/led/articles/2002-07-30-LBledBillboards.php3http://www.clearchanneloutdoor.com/product/default.asp.

19 Rashid Mat, Marketing Representative, Setia Haruman Sdn. Bhd., Interview, Cyberjaya, 24 March 2004.

20 Townsend, *Wired/Unwired* (2003), Chapter 7.

21 Dennis Frenchman, "Media Street Elements, Guidelines, and Illustrations," Working Paper, 27 January 2003.

22 Downtown Alliance, *Downtown New York Streetscape Plan*, January 1999.

23 Moving Audience Student Project, Ville de Cannes-MIT Workshop Fall 2003. See also, Panagiotis Chatzitsakyris, Gonçalo Ducla-Soares, and Alejandro Zulas, "IN-Visible: Perceiving Invisible Urban Information through Ambient Media," CHI 2004 Vienna, Austria, 24-29 April 2004.

chapter 5
attracting talent: "software"

All four projects emphasize people because project developers have learned from past examples that "software" should not be taken for granted. However, based on discussions with planners it is very challenging to incorporate less tangible aspects like community building. [1],[2] This difficulty highlights two sides of people-power that are required to achieve success. On the one hand, public and private actors – who are researching emerging opportunities and working to develop the best possible environments – are driving the vision for these developments. On the other hand, a rich talent pool is being courted to achieve stated goals of urban vibrancy and interaction.[3] Together, team members designing the areas and targeted individuals constitute the "software" that will make or break the success of any emerging innovation zone. Acknowledging the challenges, the first group is devoting financial and organizational resources to the "soft" development program that leads to the following complex narrative of kick-starting urban life. *Designing spaces that will initiate interaction for innovation poses a significant challenge for designers who focus on the possibilities emerging live-work patterns suggest for better urban environments.*

Critical mass is the key phrase which is reiterated in all project descriptions. Like in earlier technopoles, certain firms of various sizes are targeted and provided with incentives. Large R&D firms, universities, multinational corporations and smaller or medium-sized local firms seem to be the key target groups for the planned technopoles. And making compromises to fill rental space quickly is not the desirable path because it will dilute the long-run goal of developing a reciprocal ecosystem of firms from various fields. One senior official from a Singaporean statutory board described his experience in previous science parks that seemed empty in their early stages and then became full as soon as critical mass had been achieved.[4] Whether the project aim is to generate innovation like in one-north or attract the most cutting-

edge media firms as in Seoul, sending the right messages with tenant mixes is paramount.

Establishing critical mass also entails marketing the developments to individuals in addition to firms based on the assumption that people attract more people. William H. Whyte called this notion "self-congestion."[5] The projects are specifically designed to attract "talent" to an urban neighborhood from the surrounding metropolitan area (Seoul) or from around the world (Singapore, Kuala Lumpur).[6] After one of the first Advisory Panel meetings, *The Straits Times* ran an article entitled "Science Hub Seeks to Be 'Talent Capital of the World'."[7] In Singapore, this effort is grounded in the realization that human capital is the country's competitive edge. Therefore, the government is now also encouraging newcomers from Europe, Asia, the United States, and Australia to move to Singapore and even start businesses there.[8] Lower Manhattan is similarly attempting to retain and draw a diverse group of employees as jobs in the FIRE sector wane.

At one-north a small business incubator named Phase Z.Ro (figure 5.1) has been placed on-site as a temporary use. Until Biopolis and Technopolis grow out towards the Buona Vista MRT station simple container buildings serve startup firms that can apply for the extremely affordable units. The notion is to seed development on site without creating permanent structures that inhibit future growth. The small firms are considered part of the overall mix

Fig. 5.1 | Photograph of Phase Z.Ro Photograph by author March 2004.

that will make one-north successful.

Live-work lofts in nearby Holland Village called Chip Bee Gardens (figures 5.2, 5.3, and 5.4) serve young professionals and artists working from home. The hybrid zone should attract the diverse group targeted for one-north over all. The most significant attempt to seed a creative environment is the artists' colony in Wessex Estate (figure 5.5). These colonial black and white houses have long been home to artists because of their relatively large spaces and affordable rents. JTC is encouraging artists to stay in their community and is pursuing a program for the arts that would encourage cutting-edge work. Plans involve providing pay-as-you-use studio space for artists, rotating gallery shows and public art initiatives throughout the development.[9] For example, invited artists have created works on display in the almost completed Biopolis area.

Fig. 5.3 View of renovated arcades at Chip Bee live-work apartment complex. Photograph by the author March 2004.

Fig. 5.2 Rendering of proposed renovation of Chip Bee apartment blocks adjacent to Holland Village. Provided by JTC, March 2004.

Fig. 5.2 Sign at Chip Bee live-work apartment complex. Photograph by the author March 2004.

Together, these three strategies should to add up to a diverse and complementary mix of residents and employees at one-north that JTC believes will drive innovation:

> With the world-wide-web, highly innovative talents who are behind the wealth creation of nations have gained enormous power to influence the decisions of corporate leaders on where to locate their value creation centers. These talents become highly mobile, and they look for fun and interesting places rather than efficient, clean, corporate and mall-like cities. (JTC, "A Web of Enabling Plans," 5th Resource Advisory Panel Meeting Paper, Singapore, 3-4 December 2003: 1.)

Attracting a diverse talent pool to the area is only the first step, however. Subsequently, project design is supposed to encourage the type of creative exchange that allows value-added work to take place. These "knowledge accidents"[10] are meant to occur within specially designed areas of the project (see also Chapter 3). In one-north, several pocket parks, recreational spaces and transition zones among uses are intended for informal exchange:

> Physical spaces that allow interaction are spaces that encourage knowledge transfer. There are spaces that support such interaction like lecture rooms or meeting rooms. To allow more spontaneous interactions, it is sometimes achieved by combining space of congregation with space for knowledge. (JTC, "A Web of Enabling Plans," 5th Resource Advisory Panel Meeting Paper, Singapore, 3-4 December 2003: 1.)

The project developers understand the inevitable skepticism they face for trying to exert control over random encounters, but they propose many small pocket spaces to increase the likelihood for unanticipated meetings to happen. In terms of environmental factors, Whyte describes the idea of "triangulation," which is the "process by which some external stimulus provides a linkage between people and prompts strangers to talk to each other as though they were not." [11] These impressions are located on the street and in urban public spaces. Spatially, Japanese architect Kisho Kurokawa believes "buildings

Fig. 5.5 | Wessex. Photograph by the author March 2004.

Fig. 5.6 | Renderings of Nepal Park. Provided by JTC, March 2004.

should ideally be integrated with vibrant street culture. We should try not to follow the typical designs where a tall building is followed by a stretch of open space and then another tall building."[12] An example of these integrated zones in one-north is a historic preservation area called Nepal Park, which forms an arc between two of the industry-specific nodes Biopolis and Fusionpolis (figure 5.6). Urban infill is intended for this park-like rolling landscape to draw pedestrians from one pole to the other along pleasant paths, retail and restaurants. The plans and initial drawings sketch a vision for a lively urban space that could be part of a young, hip neighborhood.

Fig. 5.7 | Makan Sutra Food Court. Photograph by the author March 2004.

Residents and workers are assumed to interact in these spaces based on a relatively haphazard understanding of exchanges: "Recognizing that the unplanned spaces between the planned often surprise and trigger inspiration, one-north masterplan carves out a complex network of public spaces from the mixed use development massing to enable a web of unplanned interactions for the community."[13] In Seoul, the planning for a "permeable edge" between the public, street life and the private commercial retail and office spaces was also intended to foster more interaction. The blending of physical and virtual realms is most apparent at the previously hard edge between private and public zones when wireless devices enable users to conduct activities anywhere anytime. As with the pocket spaces in one-north, this mixing should enhance the chances for fruitful encounters to take place spontaneously on the media street.

Still, if they are attractive enough the locations may draw a considerable crowd at least from within the development. A testament to the potential success of these plans is the existing food court at one-north named Makan Sutra or Soul Food in Malay (figure 5.7).[14] The most popular hawker stalls from around Singapore were assembled in the food court. One stall rotates periodically to provide some variation. The hawker stalls currently have incentive rents to insure that meal prices remain affordable.

Spaces of interaction like Makan Sutra are intended for local and foreign talent because all the projects seemingly embrace multiple cultures.[15] In Malaysia, the construction of a multicultural identity is contributing to the image of the "high tech" worker.[16] Singapore includes a similarly diverse population with a Chinese majority. Seoul's population base is not as diverse, but DMC is also presumed to be a place of exchange between local and foreign talent as well as a residential location for foreign knowledge workers while they are stationed in Seoul.

The open, tolerant rhetoric of the information age (see sample below) sometimes conflicts with events on the ground:

> Innovation and R&D must benefit the industry and communities at large so that for ever dollar invested, a return is visible to the lower end of society and the industry at large. No one sector of the society should be marginalized. (Science, Technology and Innovation Minister Datuk Dr. Jamaludin Jarjis in "Blueprint for MSC Advancement," *New Straits Times*, 15 April 2004.)

The most extreme examples would be the displacement of Indian agricultural workers in Malaysia who have arguable not benefited at all from pro-innovation measures in Cyberjaya and the MSC.[17]

Less dramatic and more akin to processes of gentrification, the existing community at one-north feels threatened by the project. The SLA owns all the units (single-family homes and walk-up apartment buildings). Residents rent the units through appointed real estate companies and many units are occupied by expats.[18] Rents are affordable and (some very longterm) residents are opposed to leaving the area. However, adaptive reuse and site modifications require that most residents move out of the neighborhood at least during part of the construction phase. While some artists live in the area and are encouraged to stay most of the existing residents probably do not fall into the knowledge worker or artist categories. However, these residents have long-standing relationships with each other and many have lived

in the neighborhood for many years.

In an attempt to bridge the old and new communities, JTC relocated a neighborhood 50-year old F&B outlet Colbar (Colonial Bar) from demolition by LTA's road project to the south of the development (figure 5.8). Colbar is an excellent example of a third place in Oldenburg's definition and would have been sorely missed by the neighborhood. A construction crew moved and rebuilt the shack as close to the original site as possible where it now stands as though it had always been there.[19]

Fig. 5.8 Famous ex-pat Col Bar in its new location after it was transplanted from its original site where a new road is under construction by the Land Transport Authority (LTA). Photograph by the author March 2004.

Traditionally, Colbar has been a place for ex-pats to congregate and exchange stories. Whether it will be equally popular among a more diverse crowd is unclear. A recent experience in Makan Sutra Food Court demonstrates some of the challenges. Within the Biopolis area, construction workers are currently the most visible employees using the site. The Makan Sutra Food Court was opened to construction workers causing quite a stir among the first researchers already moved into offices within the development. Construction workers are now required to leave their helmets and tools at the door to the food court (figure 5.9). Initial negative reactions show that cutting across class and status boundaries does not go without saying among the most educated groups.

Diversity is thus accepted only up to a certain point and mostly within the category of knowledge worker. This debate reflects a broader, ongoing discussion in Singapore about national identity.[20] Providing a conducive environment alone will not ensure that these diverse groups interact.

Part of the difficulty with the talent magnet idea can be traced to the haphazard use of the word community. In *Community*, Suzanne Keller reminds readers of the complexity of the

construct and the concept: "community is tangible, proximate, based on direct contact, mutual awareness, and a sense of empathy with those with whom one shares one's life in a definite place. In community, self and terrain are intertwined." Jacobs's neighborhoods are such communities where social ties and personal lives are inextricably linked. Part of the attraction of this connection for technopoles is that it fosters interaction that might lead to innovation and growth. However, the cases beg the question whether community can be created or based on economic ambitions. A community can certainly transcend the boom and bust cycles of the "high tech" industry, but it is unclear how that will take place in these projects. As a caveat, it should be stated that technopoles for all their use of urban neighborhood language like cyberspace itself do not replace the physical and social ties rooted in urban places. Meaningful ties are maintained through online and offline communication that oftentimes complement each other, but also lead to changes such as more intense long-distance relationships.[21]

Fig. 5.9 Sign posted at the entrance to Makan Sutra Food Court with sign that reads "Please Leave Your Helmets Here!" Photograph by the author March 2004.

Towards the end of becoming an urban milieu, achieving diversity and critical mass are superseded in most cases by the desire to construct a unique identity that is presumed to draw the right talent mix. Case-based lessons learned form the basis for most early stages of developing a technopole when delegations travel around the world to learn from previous projects. Previous technopoles and large-scale real estate development deals are studied as models for development and then adapted to a local context. London Docklands, Roppongi Hills, Silicon Valley, Sophia

Antipolis, Helsinki, and many more are just some of the examples of the fact-finding missions the development teams have conducted.

Along with identity comes branding. With the exception of Lower Manhattan, marketing initiatives attempt to send a clear message to potential clients of "what it's all about." The level of abstraction ranges from project to project with Digital Media City holding down the clearer end and one-north veering towards more abstract association that Singapore is one degree north of the equator. In Chinese, the character used has a double meaning explained below:

> **What our logo means – the name**
> one-north has very positive associations - new, first, winning, leading. It is a name which has been specially created and is therefore unique. It also represents where Singapore is in the world - one degree north of the equator. Our Chinese name is a direct and expressive interpretation of our English name one-north. Its meaning may also be translated as "the only one". Its phonetic pronunciation is "Wei Yi".
> (www.one-north.com, From the one-north website.)

This level of complexity is obviously lost on most people considering the survey results mentioned above. Other names like Cyberia (pronounced Cy-ber-IA but affectionately called Cy-BER-ia), Fusionpolis, Biopolis, and Cyberview convey Buck Rogers-style urban development, but probably do little to attract cutting-edge individuals to the area.

As these planned projects struggle to build up an identity through branding, places like Manhattan are considered authentic. And yet the trend to use that name follows a similar logic. The notion of "downtown" is historically connected with Lower Manhattan leading to the widespread use of that term. Downtown Alliance is using that asset in repositioning the business district as an innovative, up to date place.

Survey results and project recognition fall under the success measurement metrics that are very sensitive. The risk of becoming a white elephant is very high and public officials need to justify large expenditures such as estimated 520 million Singapore dollars for Biopolis and 567 million Singapore dollars for Fusionpolis by providing high-quality products.[22] However, those costs do not factor in all the road and infrastructure costs even though they are also carried by the development.

Cyberjaya, for example, is not managed independently and all figures are aggregated at the MSC level. The entire metropolitan region is included in that zone, which makes it

very difficult to determine the actual investment levels and costs within Cyberjaya. The administrative costs are likely also very high in Cyberjaya because MDC is a large organization as opposed to the streamlined JTC team of approximately 35 employees.

The users from the preceding chapter are also the talent pool economic growth experts are trying to attract to the technopoles under development. Without the right mix of firms and employees, a cycle of innovation will hardly be set in motion in any of the projects. However, the pool is limited in number and many cities are competing for the number one position. People are the glue which holds together these developments. Natural urban environments attract a host of different groups that rub shoulders and interact. On the one hand, these projects aim to generate that very same feeling and only ongoing observation will tell how successful they can become. On the other hand, the schemes suggest who should play an important role in the future communities which are not inclusive of all groups.

(Endnotes)

1 Please note that the word community is used here in a generic way to mean a mixed group of residents, employees, and visitors. The notion of community in these projects is discussed in more detail elsewhere.

2 Based on conversations with planners in Singapore and Malaysia.

3 Rosabeth Moss Kanter describes how firms in the information economy struggle to attract and retain young, talented workers in much the same way. "Winning the Talent Wars," Chapter 7 in *Evolve! Succeeding in the Digital Culture of Tomorrow*, (Boston, MA: HBS Press, 2001).

4 Dr. Christopher Chia, Chief Executive, National Library Board, Interview, Singapore, 29 March 2004.

5 William H. Whyte, *The Social Life of Small Urban Spaces* (Washington D.C.: The Conservation Foundation, 1980):19.

6 Kathy Ng Yin Loo, Executive, MSC Physical Infrastructure, Regulation Department, Multimedia Development Corporation, Dylan Yee Kar Sein, Executive, MSC Physical Infrastructure, Regulation Department, Multimedia Development Corporation, 24 March 2004, Cyberjaya, Malaysia.

7 "Science Hub Seeks to Be 'Talent Capital of the World'," *The Straits Times* (16 July 2001).

8 David Rosenberg, *Cloning Silicon Valley: The Next Generation "high tech" Hotspots* (London: Reuters, Pearson Education, 2002): 34.

9 BG (NS) Philip Su, Assistant CEO, JTC Corporation, one-north, Interview 30 March 2004.

10 Term from a discussion with management consultant specializing in knowledge management.

11 William H. Whyte, *Social Life of Small Places* (1980): 94

12 "Science Hub Panel Meets to Discuss Project," *Business Times* (16July 2001).

13 JTC, "A Web of Enabling Plans," 5th Resource Advisory Panel Meeting Paper, Singapore, 3-4 December 2003: 2.

14 The name is also the same as a local hawker stall food guide, which is very popular.

15 Note that the discussion about multicultural realities in a "high tech" world are complex and discussed briefly in the conclusion.

16 Timothy Bunnell, "(Re)positioning Malaysia: "high tech" Networks and the Multicultural Rescripting of National Identity." *Political Geography* 21, no. 1 (2002): 105-124.

17 Tim Bunnell, Email exchange 6 April 2004. and "A Multimedia Utopia? A Geographical Critique of "high tech" Development in Malaysia's Multimedia Super Corridor." *Antipode: A Radical Journal of Geography* 34, no. 2 (2002): 265-295.

18 Ex-patriots, demographic information from Kai Wen Wong, Honors Thesis, Department of Geography, National University of Singapore, 2004.

19 BG (NS) Philip Su, Assistant CEO, one-north Development Group, JTC Corporation, Interview, Singapore, 30 March 2004.

20 The book written by a former Belgian who became a Singaporean citizen. He wanted to show his commitment to the nation and describes how he sees his future and that of the island. Alain Vandenborre, *Proudly Singaporean: My Passport to a Challenging Future* (Singapore: SNP International, 2003).

21 Keith N. Hampton, and Barry Wellman, "The Not So Global Village of Netville," and Quan-Haase, Anabel, Barry Wellman with James C. White and Keith N. Hampton, "Capitalizing on the Net: Social Contact, Civic Engagement, and Sense of Community" in Barry Wellman and Caroline Haythornthwaite, eds. *The Internet in Everyday Life* (Malden: Blackwell, 2002).

22 Cost estimate from Assistant CEO (BG) Philip Su.

chapter 6
findings, results, scenarios

All three of the planned projects as well as the Downtown Alliance in Lower Manhattan will continue implementing their visions for vibrant, productive urban spaces that can also embrace the potential of emerging technologies. Coordinated displays, addressable street furniture, location-based services and easily accessible wireless connectivity are only some of the potential directions for future exploration. The following findings provide initial thoughts on how these projects will evolve and what experience to date suggests for urban transformation and the reconceptualizing of urban space through technopoles.

Rescripting Urban Spaces

Technopoles contribute to the rescripting of urban spaces. The preceding examples provide several base cases for emerging patterns that should be monitored over the next several years. The narrative shows that the urban environment, technology and users cannot be treated distinctly and planning, urban design, and development processes should reflect how "hardware", "wires", and "software" interact as they reinforce certain spatial and socio-economic relationships in cities. The cases begin to depict how urban form can contribute to the process of innovation in technopoles, on the one hand. On the other, some inherent contradictions and challenges emerge equally vividly. Borrowing Manuel Castells's terms one could attribute these contradictions to the binary logic of "space of places" and "space of flows":

> In the absence of symbolic bridges between non-communicable spaces of places, and the global, a-historical, primarily instrumental space of flows, we may assist in creating the crisis of urban civilization. (Manuel Castells, "The Culture of Cities in the Information Age," [1999] in Ida Susser, ed. *The Castells Reader on Cities and Social Theory,* Chapter 9, [Oxford: Blackwell, 2002]: 382.)

Framed culturally, a similar dichotomy exists between homogenous, global and often Western culture and distinct local identity which would "depend upon whether South East Asian leaders, both political and business, can be persuaded to share that commitment to a uniquely tropical built environment and life style. This would be truly revolutionary. The trend towards international homogeneity, like the trend towards an average indoor ambient air temperature, seems for now to be irresistible."[1] The projects provide evidence both for increasing homogeneity and increasing specificity among similar zones around the world. All the projects try to differentiate themselves while they provide the same or better levels of service and cutting-edge facilities as comparable zones in other cities.

The need to differentiate and match other places at the same time complicates implementation processes. Practitioners are faced with messy realities that overcome the dichotomies established above. The following reflections and conclusions analyze the rescripting of urban neighborhoods in technopoles as overlapping spaces of places and flows. The end-result generates an associative space that suggests many challenges for urban change as we move into the 21st century.

Of Testbeds and White Elephants

As with past projects, technopoles remain costly public and private endeavors. The projects studied here require significant amounts of public and private funds to design, implement and manage for which they are often characterized as white elephants. Shrugging them off in this way, however, fails to acknowledge the underlying goal of staying competitive and preparing for the next economic upswing. In the 2001 UNDP Human Development Report *Making New Technologies Work for Human Development*, it says: "The technology revolution begins at home – yet no country will reap the benefits of the network age by waiting for them to fall out of the sky."[2] These projects aim to reap the benefits of the network age for a prosperous 21st century.[3]

Towards this goal, the studied examples suggest four types of planned technopoles that could be considered a revised taxonomy building on Castells and Hall (1994):

1. Bringing nature and technology together (improving on Silicon Valley and extending past technopole paradigms such as Sophia Antipolis)
2. City as laboratory for technology
3. Holistic development scheme for exciting live-work environment
4. Retrofitting the existing city

The categories suggest where future planned developments will take place under the stewardship of private and/or public actors. And they also show how these actors are anticipating future waves of economic prosperity in the city.[4]

Patenting the City

21st century technopoles are attempting to overcome the image of nondescript science parks. And urban settings serve as a metaphor for exchange and interaction targeted for the new generation of live-work environments. The projects move beyond their antecedents in an attempt to patent the idea of the city as a productive economic space. In other words, the projects suggest models for improving productivity by (re-)creating stimulating urban environments. These premonitions are hardly indicative of future populations living in science parks; rather, the designs react to past projects:

> I think you've got to consider this question against the background of the somewhat sterile, mono-cultural 'life' of many science park developments (I believe that the same is true of some of the 'science cities' but I don't know). There's not a lot of scope for serendipitous interaction on most science parks; particularly when the organisations are big, inward-looking ones.
>
> Having a range of 'creative' activities within easy reach of the scientists/technologists may offer new, neutral, opportunities through which they can interact – through another facet of the their interests talents. So, for a *new* place it may be a way of building social capital more quickly than would otherwise be achieved. (Bill Wicksteed, Email correspondence. [March 2004].)

In an effort to encourage interaction and communication among groups, small urban spaces, transportation and circulation patterns as well as services are integrated into previously sterile office parks. In some cases, the projects may overcome their newness and perhaps in the distant future join the ranks of urban neighbourhoods such as SoHo, New York and South of Market, San Francisco.[5]

These areas gain their vibrancy from their authentic identity as authentic urban spaces.

In Medieval Europe, urban space was said to make you free (from feudal obligations) as in Stadtluft macht frei (city air makes you free)! Hall uses this motto throughout his chapter on innovation in great cities throughout history. Creating zones for special types of economic activity should not be mistaken for recreating those spaces of freedom to think at will. Harnessing that creative energy would be truly remarkable. In a sense, technopoles remain the "mines and foundries" Castells and Hall took them to be rather than instigators of cultural movements.

The new projects attempt to guide the process of innovation.[6] The level of productivity as measured in innovative output such as patents does not reflect urban reality. In fact, the projects attempt to foster more creative and scientific advances than would otherwise take place thereby improving upon "real" urban spaces:

> Whilst urban areas have spread out and dispersed virtually 'to the point where territory and metropolis are synonymous', writes Francisco Cerver, 'at the same time within the city, new construction have appeared which are more "city-like" than the city itself; that is, they are a distillation and intensification of the concentration that the city symbolizes... (Francisco Cerver (1998: 29) quoted in Stephen Graham and Simon Marvin, *Splintering Urbanism: Network Infrastructures, Technological Mobilities, and the Urban Condition* [London and New York: Routledge, 2001): 223, 226.)

If the trend today is to create these specialized zones that are better than the real city, then nothing is left to chance. Serendipitous encounters are planned to take place in designated areas. Specialized local and foreign talent is recruited to an area that becomes the ultimate innovation powerhouse where residents are unaware that they are part of attempts to kick-start the knowledge economy. Most of the planning efforts in the studied projects are directed towards determining the right mix of uses, facilities, available technologies and public spaces to increase the number of chance encounters that facilitate exchange.

Flexible City Spaces and Recombined Real Estate

In these projects real estate is not only valued in terms of square footage and grades of space, and location, but rather in terms of intellectual property (IP) output as measured through patents granted per square foot and per time unit. In the words of a Hadid design team member, the challenge is to "generate IP through the plan."[7] In this process, transience is not negative so long as critical mass is maintained over time. Buildings are used and reused

by tenants as needed. Amenities and shared facilities attract the "right" groups to this place where they are encouraged to move about as much as possible. Services, mobile and wireless communications support, media displays and other integrated technologies are an attempt to offer better and more activities for people faced with many options.

Flexibility is embraced as a key component of these systems. The state of flux projected for the developments necessitates a different approach to real estate as something, which is flexible and modifiable. Alongside economic development consultants, real estate developers also have a role in attracting growth to certain areas. Indergaard notes the importance of real estate companies in creating the Silicon Alley story in Manhattan, which sparked a wave of new media development in New York.[8]

And yet technopoles are built artifacts. The spatially-bound nature of the projects contradicts the mobile flow of talent and capital they are designed to harness. Technopoles have long life-spans and downswings such as the decline of Silicon Alley in Manhattan would be devastating for a planned project, which intends to be a foundation for growth. In the three Asian cities, governments are acting as venture capitalists to ensure stability in troubled times. How this aspect of the projects coincides with the attempt to build dynamic and diverse districts remains to be seen.[9]

City as Laboratory

One of the promising directions for technopoles could be their nature as urban labs. Location-based services and support for "anydevice" anywhere anytime have a long way to go, however. As Townsend remarked in his dissertation, existing urban infrastructure systems are not value free and the technopoles are overlaid onto that uneven system. In part, the visibility of wireless connectivity is simply used to demonstrate the availability of telecommunications infrastructure in a specific zone by inciting people to use their devices and laptops in spaces that may not be designated work zones. How specifically these systems benefit employees and residents goes beyond the scope of current discussions.

Overall, most of the technology will facilitate rather than generate new uses. For example, wireless connectivity is a convenience, but not often the only reason for traveling to a certain place. Some visitors have been known to travel to Lower Manhattan to take advantage of free wireless services while admiring the Statue of Liberty. Another example is

a taxi-driver who used his PDA while parked near Bryant Park during the summer months.[10] In both cases, users sought out certain locations to take advantage of unique services in specific locations along their daily route. They demonstrate behavior that is indicative of dynamic and diverse communities. However, these groups will probably create exciting living environments for themselves regardless. Rheingold's *Smart Mobs* describes an example from Tokyo:

> A growing number of people in Shibuya Crossing now divide their attention among three places at the same time. There's the physical world where pedestrians are expected to avoid walking into each other. Surrounding the crowd is an artificial but concrete world, the city as the all-enclosing environment of commercial propaganda described more than thirty years ago as *The Society of the Spectacle.* Less garish but no less influential than the neon and video of the twenty-first-century metropolis are the private channels of the texting tribes, a third sphere in which bursts in terse communication link people in real time and physical space." (Howard Rheingold, *Smart Mobs: The Next Social Revolution* [New York: Basic Books, Perseus Books Group, 2002]: 2.)

> \I think it's about encouraging interactions – which will be especially important in Singapore, given the likely continuing reliance on high calibre people coming for a limited period of time – e.g. from Europe, India, US and China. (Bill Wicksteed, Email correspondence. [March 2004].)

Urban form is taken to support knowledge spillover based on a rather haphazard understanding of how and when people interact. To create a diverse eco-system of innovative people requires building a community in a specific place over time. Eventually people settle in certain areas and become local. Technopoles should foster a sense of indigenous knowledge creation rather than become a repository for global nomads. The urban forms chosen for the spaces do not need to feel airport-like in their neutrality. Whether locally inspired or contemporary in nature the urban environment should distinguish itself by its character rather than its lack thereof.

One barrier towards this goal is the persistent growth pole idea. Growing out from around one pole may not coincide with the natural development patterns of many industries or the residential preferences of workers. And by stressing housing, entertainment, and retail uses within the boundaries of one large project it seems almost impossible to draw on the strengths of the surrounding city. In many ways, the projects are creating autonomous islands that espouse their own internal logic of urban space and will be integrated into existing life-patterns with great difficulty because other people have no reason to go there. In Singapore, JTC is attempting to include public uses and restaurants that should attract people from all around the island. And the project is being designed with three simultaneous catalyst nodes to

overcome the idea of one center. How this plan will interact with the idea of providing all types of urban uses within the boundaries of one-north remains to be seen. Nevertheless the projects effectively distance themselves from their suburban office parks antecedents.

In contrast, the Downtown Alliance's work consists of very small and distributed physical interventions. Perhaps, these infill strategies will prove more successful in the future. The compact, high-density area around the nodes provides the glue which holds the effort together. Still, the notion that physical proximity alone is enough to generate interaction needs to be confirmed; and the relationship to the surrounding urban fabric is equally ambiguous. The DMC and one-north do not stand alone nor do they necessarily mesh with the surrounding urban fabric.

Diversity

The urban nature of the projects is intended to encourage diversity, which is mentioned as a key attractor for creative communities. First, several of the development strategies promote diversity as a vehicle for enhancing innovation. This equation seems very difficult to prove, however. For example, Finland, an extremely homogenous country, is one of the leading innovation and knowledge economies in the world. Second, it is unclear what kind of diversity is being targeted.

Cyberjaya evidences the contradictory understanding of diversity very well. Figure 6.1 shows one example of an advertising campaign by SHSB developers to promote the inclusive nature of Cyberjaya, which privileges knowledge workers and students that are considered the building blocks of the new economy. The island-like nature of Cyberjaya masks how the development process has taken place. Displaced agricultural workers – who are Indian by culture like the "high tech" workers being attracted to the multicultural park – have only rarely found new jobs within the development. The rescripting of the city is having a very real impact on the lives of several communities who do not feature in the creative and innovative neighborhoods targeted by the ambitious development plans. The primary goal of the case research was not to uncover uneven distribution of space, which does not seem surprising. However, it is important to note that the "splintering" of the city goes beyond a theoretical and abstract concept. Bunnell notes that ""high tech"" has further legitimized this logic.[11] Fragmentation affects real people and their existing neighborhoods while the newer and

"better" neighborhoods, technopoles, take their place.[12]

The socio-political context plays an extremely important role in the success of technopoles as spaces of innovation. Building on the discussion about diversity and the previous section about fostering creative thinking, the more general "climate" in the urban region may have a greater effect in attracting the right talent mix than is often assumed. Competing with New York City is in part impossible because there is a freedom to express and exchange a multitude of opinions and ideas. Without the ability to exercise this right the city would not have attracted the range of permanent and temporary residents that have passed through over time. Lawful guarantees of intellectual property rights such as the Malaysian "cyberlaws" is not enough if a general lack of openness reigns in a location. Hall's study of various cities where great innovation has taken place points out that state-guided systems can produce great scientific and technological advances in the past. He cites Japan and 19th century Germany as examples, which are less dependent on the urban milieu: "Strictly, the bureaucratic model should have no need of urban support systems."[13] Ironically, the cases discussed here are being developed with urban models in mind by public-led partnerships. Providing conclusive evidence for laissez faire or state-guided development seems very difficult – and Hall does not make any determinations either. Important for the ongoing projects will be monitoring trends like an increasingly mobile workforce in planning for the future. With increasing choices available to certain workers and more diverse communities searching for a resting place, milieu-attributes such as freedom to express views and opinions politically and culturally may determine, which cities are included in the next volume of *Cities in Civilization.*

Fig. 5.5 Advertising campaign for Cyberjaya in *Lines and Curves: Cyberjaya. A City Inspired.* Setia Haruman Sdn. Bhd. Advertising Publication.

East – West – Global

The East-West and global dynamics that are part of the discussion on diversity are equally contradictory. Most of the projects draw on each other as models and also refer to many other urban megaprojects in Asia and in Europe and the United States such as Canary Wharf in London or Roppongi Hills in Tokyo. Without exception, actors involved in these developments position themselves in relation to a global network of privileged urban spaces. Olds calls these developments "epistemic communities" because the involved professionals work on similar "world-class" projects in cities across the globe.[14]

The studied examples suggest two things: (1) ever more unified global trends, (2) a reversal of pervious technology transfer trends from west to east. Three of the planned projects are located in major Asian cities. In all cases, the project developers are looking to places in the West, especially Silicon Valley, as models for success. Increasingly, however, it seems that these Western models are no longer sufficient especially when it comes to the level of infrastructure and quality of urban spaces targeted. Before embarking on any of these projects, most of the team leaders conduct study tours. MSC and one-north are both guided by international advisory panels and regularly visit projects abroad. Seoul hosted an international conference for all the other cities attempting similar projects in October 2003, which a team from Lower Manhattan attended. Several case studies from Europe were also presented at the conference showing that learning is taking place from West to East and the other way around. The uncanny resemblance of some spaces to suburban office parks (especially in Cyberjaya) is negligible compared to the way the projects embrace mixed-use and density. Considering that countries like South Korea are more electronically connected than the United States or Europe, it seems possible that in future Western cities will be looking to Asia for models of how to develop successful technopoles.

A study tour of these cities by a group of American real estate developers confirms this trend to some degree. A summary of their trip to seven cities in Asia (which included the three cities studied here) demonstrates how overwhelmed the team was:

> The 21st century vision became very apparent as you watched the people on the streets and malls. We bought soda from a machine using a cell phone, paid for parking with smart cards, saw buildings managed with very sophisticated information systems and witnessed firsthand the emergence of a 21st century lifestyle. (Realcomm Advisory, "Asia Real Estate," The Commercial Real Estate, *Business Solutions and Technology Resource* 3, no. 6, 11 February 2004.)

These American developers believe to have seen a glimpse of the future and will probably import that future with them to projects back in the United States. In some ways, the East is now a model for the West, which is feeling further and further behind the technology wave, which is associated with the future. For the moment, the West still seems to have a grasp on the truly creative and innovative industries but that is being threatened as well and specifically by the agendas driving the technopole projects discussed here.

The most striking aspect for these visitors was the speed of development taking place in Asia and what is necessary to keep up with this rate of change. At the same time, government officials, for example in Singapore, are trying to accommodate population growth and expansion to sustain a higher standard of living. In Malaysia where land is affordable, the country is looking for ways to stay competitive as low-wage jobs migrate to India and China.[15]

Ironically, as the Western visitors look on in astonishment they forget that many of the technologies that have sparked this – by some believed to be unsustainable – urban growth originated in the West:

> The technology which has accommodated South East Asia's rapid urbanization has, for the most part, been acquired by technology transfer from the West. The literature has emphasized the importance of new modes of transport, especially the motor car. Equally dramatic has been the application of imported technologies to the built environment, especially in construction, internal transport (elevators, escalators), internal communication (telephone networks, computer systems) and temperature control (heating, ventilation and air-conditioning). This package of technology can be seen in office buildings, hotels, shopping malls and airports. (Peter Hall, *Cities in Civilization* [New York: Pantheon Books, 1998]: 309.)

And the technopoles include all of these elements, but in a unique combination and at more advanced levels, which is so impressive to the visitors from abroad. As city officials and developers from Europe and United States start to visit the Asian projects the technology transfer direction may well be reversed with effects on future development models that are yet to be determined.

Suggestions of Elements *that Would Actually Work*

Looking at technopoles as designed places and studying them spatially at the scale of urban neighborhoods shows some of the strengths and weaknesses of these projects beyond their economic output. Putting aside tabulations of the number of firms and traditional economic growth criteria the narrative uses the construction of real places to highlight some of the inconsistencies and some of the potential benefits of technopoles. We know from experience that certain types of places are more attractive for various reasons at various times. The basic assumption – as with economic development – is that you cannot recreate Silicon Valley, but public and private actors can contribute to a more "enabling" environment through urban vibrancy. Information and telecommunications technology has brought production back into the city from the factory and now the question is how to harness that potential.

Parallel shifts in live-work patterns create opportunities for building more integrated mixed-use neighborhoods that would actually become vibrant urban areas in addition to being successful office parks.[16] These environments offer exciting experimental ground for pushing the envelope in terms of integrating location-based services, displays, and other amenities into the environment through technology.

What also crystallizes clearly in the case examples is that these opportunities do not solve existing social and economic inequities and as such continue to contribute to the type of splintering urbanism identified in the 1990s. The confusing discourse around neighborhood, community, talent mix, and urban interaction lies at the heart of the major contradiction in these projects. The contradiction emerges in discussions with the actors involved: There is a clear goal among many to design a truly beautiful environment that can benefit the city as a whole and support new communities. Nevertheless the overarching goal is to generate profitable innovation at least in the long run. The upshot is that these areas are not mini-cities, but pieces of developed fabric that are very much grounded in current thinking about what will spark economic growth in the future.

In the process, some exciting opportunities arise for designers and urban planners to reintroduce mixed-use, high density and services. To achieve these goals will require patience and a decided step away from the boom and bust of previous "high tech" cycles.[17] As the projects evolve many additional lessons and findings will emerge and observers should look closely for working models. If these projects truly represent a leap forward from past

technopoles than they may be part of an emerging pattern. In other words, the next step is similar to Christopher Alexander's recommendation when he introduces *A Pattern Language*: "It is essential then, once you have learned to use the language that you pay attention to the possibility of compressing the many patterns which you put together, in the smallest possible space."[18] The overlapping patterns of neighborhoods, technology, and floating populations pose an ongoing challenge for all members of our urban communities and practitioners in the field.

(Endnotes)

1 Howard Dick and Peter Rimmer, "Privatising Climate: First World Cities in South East Asia," Chapter 12 in John Brotchie, Peter Newton, Peter Hall and John Dickey, eds. *East West Perspectives on 21st Century Urban Development: Sustainable Eastern and Western Cities in the New Millennium* (Aldershot: Ashgate, Brookfield USA, 1999): 324.

2 UNDP, *Making New Technologies Work for Human Development* (UNDP Human Development Report, 2001): 79.

3 "To stay ahead of the competitive world, Singaporeans are being told that they have to be more entrepreneurial and creative, so they can, in modern business-speak, become the free-thinking risk-takes needed to run a successful, high tech economy, wired to the Internet." In *Economist*, "On the Loose in Singapore," 29 May 1999.

4 Michael Indergaard draws on actor-network theory to describe the rise and fall of Silicon Alley in New York City, a new media district of the 1990s. The theory relates human to non-human systems and stresses their interrelated nature. *Silicon Alley: The Rise and Fall of a New Media District* (New York, London: Routledge, 2004): Chapter 1, Note 8.

5 Mark Wolfe, "The Wired Loft," *Urban Affairs Review* 34, no. 5 (May 1999): 707-728.

6 Research on knowledge workers has shown many attempts to restructure office environments leading to very different design outcomes. There is no consensus on what types of spaces are the most suited to "knowledge work." Thomas Davenport, Robert Thomas and Susan Cantrell, "The Mysterious Art and Science of Knowledge-Worker Performance," MIT Sloan Management Review 44, no.1 (Fall 2002): 23-30.

7 David Gerber, DDes Candidate, Harvard Design School, Harvard University, Interview, Cambridge, MA, 15 March 2004.

8 Michael Indergaard, *Silicon Alley: The Rise and Fall of a New Media District* (New York, London: Routledge, 2004): 15-16.

9 Michael Indergaard writes , "While Silicon Alley was a temporary base for circulating capital, the MSC effort is creating an enduring foundation for digital industry." In "The Webs They Weave: Malaysia's Multimedia Super-corridor and New York City's Silicon Alley," *Urban Studies* 40, no. 2 (2003): 379-401.

10 Stories from the Downtown Alliance and NYCwireless.

11 Timothy Bunnell, "While such negative social impacts have a long association with large-scale modern development projects, the article argues that it is specifically a pervasive discourse of high tech – and the way in which this has been refracted in the national context [of Malaysia] – which legitimizes the financial and social costs of new high tech urban development." In "A Multimedia Utopia? A Geographical Critique of High tech Development in Malaysia's Multimedia Super Corridor." *Antipode* 34, no. 2 (2002): 265.

12 Timothy Bunnell, "Cyberjaya and Putrajaya: Malaysia's "Intelligent" Cities"," in Stephen Graham, ed. *The Cybercities Reader* (London and New York: Routledge Urban Reader Series, 2004).

13 Peter Hall, *Cities in Civilization* (New York: Pantheon Books, 1998): 497.

14 Marc Boey, "(Trans)national Realities and Imaginations: The Business and Politics of Malaysia's Multimedia Super Corridor," Ch. 8 in *Critical Reflections on Cities in Southeast Asia.* Singapore: Times Academic Press, 2002): 194.

15 Hall describes the rapid growth taking place in Asia: "The pace of growth in these cities brings huge pressures for change, as the increase in global advanced-service functions leads to escalating rent levels, in turn squeezing out other activities. This is shown in Tokyo, Hong Kong and Singapore, where manufacturing has declined in importance in the 1980s and 1990s. But, accompanied by relentless in-migration of people, they also put pressure on housing land, pushing new housing construction in two direction: higher and higher, denser and denser near the center, as in Hong Kong and to some degree in Singapore; and further and further out, even 100 km away in the case of Tokyo, where the city government has passed an ordinance requiring new office buildings to have residential accommodation." In Peter Hall, "Planning for the Mega-City: A New Eastern Asian Urban Form?" in John Brotchie, Peter Newton, Peter Hall and John Dickey, eds., *East West Perspectives on 21st Century Urban Development: Sustainable Eastern and Western Cities in the New Millennium* (Aldershot: Ashgate, Brookfield USA, 1999): 35.

16 John M. Eger writes "One of the more interesting paradoxes is that the more we live and work in cyberspace, the more important real places become. While this notion runs counter to much of today's popular literature, we already are seeing the knowledge worker and the high tech, knowledge-sensitive industries migrating to highly livable communities – communities with mountains or lakes, open spaces, clean air and water, and, as in the case of Portland, Oregon, and other communities where urban growth boundaries have been established, less reliance on the automobile as the primary means of transportation." in "Smart Communities." *Urban Land* (January 2001): 51.

17 See Paul Krugman, "Crony capitalism USA" *New York Times,* 15 January 2002, 21. Cited in Indergaard, "The Webs They Weave: Malaysia's Multimedia Super-corridor and New York City's Silicon Alley," *Urban Studies.* 40, no. 2 (2003): 379-401.

18 Christopher Alexander, et al., *A Pattern Language* (New York: Oxford University Press, 1977): xliv.

conclusion
technopolitan dreaming

> This is about creating hot jobs in cool neighborhoods throughout Michigan. It's about attracting and encouraging young people to live, work and shop in cool cities they help create.
> Governor Jennifer M. Granholm

Fig. 7.1 Screenshot of Michigan Cool Cities initiative homepage. From Michigan Cool Cities Survey homepage (March 2003), www.michigancoolcities.com.

As a slogan Governor Granholm's idea to revitalize Michigan's cities (see screenshot in figure 7.1) may bear some results; but as an operational theory for future city building it is putting the proverbial cart before the horse as well as contributing to a flawed notion of urban vibrancy. The program mistakes the drivers of economic development and growth with the outcomes of growth like a diverse retail selection and free Wi-Fi access. Vibrant urban environments are living, breathing organisms that represent the accumulated efforts of many individual actors who are attracted for various reasons. The emerging technopoles studied here attempt to harness the latent potential in urban communities by taking a holistic approach to urban form, economic development and community building with the ultimate goal of riding the wave of future economic growth. As the case analyses have shown success is difficult to define and will require ongoing observation as the projects are completed. Several emergent themes crystallize across the cases.

First, these 21st century technopoles are urban infrastructural systems that connect physically and virtually to the existing urban environment. They act as focal points in a global network of flows by virtue of their socio-economic aspirations. The proposed R&D and telecommunications infrastructure as well as the incentive programs for attracting firms and

individuals show how technopole developers attempt to hook into the global network of high-tech industries.

Second, the technopole descriptions tout live-work configurations as the optimal mix of uses for the knowledge workers that are supposed to be attracted to the cutting-edge neighborhoods. Project developers have identified a shift in spatial patterns that necessitate new live-work configurations. In the projects, the spectrum of patterns ranges from live-work lofts to neighborhoods with housing and offices in close proximity.

Third, wireless and mobile communications provide the backbone for many of the activities and services supported in the projects. Most of the systems are accessed through personal devices such as pocket PCs, laptops and cell phones. Other elements are embedded within the urban fabric such as smart street furniture that reacts to environmental conditions. These enabling conditions provide a backbone urban dwellers can appropriate as they move through the city.

Fourth, public and private pocket spaces dot the privileged technopoles zones to foster chance encounters and innovation. Urban configurations act as a metaphor for exchange of information which is the currency in the knowledge-based economy. In one-north, one very large tree is ringed by a boardwalk that doubles as a bench. It allows visitors and employees to "sit on the ground" in the city while they are at work. These spaces are intimate and protected and enhance the patchwork of urban fabric significantly. Whether they are equally successful in promoting informal interaction remains to be seen.

Finally, visual information plays a pervasive role in providing stimuli for interaction with the environment and among employees. Addressable and programmable signage and displays permeate the projects. In many cases, the end-results resemble Times Square imitations, which highlights the challenge of effectively integrating visual information into the urban environment. Ambient visual information models how less intrusive systems can become effective channels for conveying environmental cues. City spaces have always been visually stimulating, but the predominance of visual information detracts from the potential of other sensory experiences.

These cross-cutting trends lead to two final observations that should inform ongoing debates on the relevance of technopoles as 21st century manifestations of urban form. First, the potential for experimentation in technopoles exists. These environments are developed

from the ground-up by unique groups of professionals who have the opportunity to push the envelope. As the cases in Singapore and Seoul show, the confluence and layering of ideas resulting from dynamic project teams should be channeled towards testing new ideas at the urban scale. So far most technologies seem geared towards encouraging communication, but ongoing research could go much further to revitalize a tactile sense for urban spaces that other layers of technology sometimes diminish.[1] These 21st century technopoles provide a platform for exploring future directions in hands-on, concrete ways.

Second, technopoles – part infrastructure and part urban fabric – reinforce existing biases in the urban environment as much as they incentivize recombinations of live-work spaces. Closely monitoring the uneven impact of these projects should be an important part of ongoing research as the projects are completed. The speed of development increases the urgency for constant oversight. Antoine Picon voices a similar concern in the context of architecture and CAD/CAM technologies:

> ...since the world appears more and more as our creation, from nature to artifacts, from materials to buildings. Thus, a new political responsibility is at stake. For architects, this implies a departure from the traditional posture of the professional indifferent to the large issues raised by his realizations. To inscribe oneself in current economic and cultural trends is probably no longer enough, considering, as Sanford Kwinter once put it, that the task of architecture is to take "the flow of historical conditions as its privileged materiality. (Antoine Picon, "Architecture and the Virtual: Towards a New Materiality," *Praxis* 6 [2004], 120.)

Picon is referring to more rapid translations from architectural ideas and concepts to built form. The streamlined process increases the vigilance architects must bring to the design process. The pace of technopole development and the direct impact trends in economic development research seem to be having on their built forms call for similar care on the part of involved planners, developers, and government actors.

Much of the responsibility lies with practitioners who construct the powerful narratives driving these projects. Seymour Mandelbaum says that the "guidance rests upon the construction of stories that describe the pattern of a desired world, who "we" are and the character of virtuous men and women, what we know as narrators, and how we may move towards the end of the tale."[2] He calls on practitioners to take full responsibility for the narratives they construct in promoting certain courses of action over others, which is an appropriate reminder for all four project teams that narrative can become reality.[3] In a striking

example, the DMC website describes "A Day in the Life of DMC" as a potential future scenario to provide a concrete example of life in a digital media district. This vision constructs a future based on current knowledge and socio-economic context that begins the thread of a specific narrative of the future. Its narrative power should remind practitioners and citizens alike that stories – like the success story of Silicon Valley – are influential tools that construct our realities as much as we construct the narratives.

Technopoles as creative, high-tech places should transcend "current economic and cultural trends" because they are part of the scripting of those trends in the urban context. And they represent such high levels of financial and human investment that cannot be wasted on enhanced office parks. Unless public and private actors remain vigilant, the desire to complete projects quickly may detract from longterm success that benefits a broader urban community. An opportunity exists to innovate in 21st century technopole projects which should not become the next wave of urban white elephants!

(Endnotes)

1 Guenter Getzinger writes: "It [the tactile sense] has lost its importance for perception and for the construction of knowledge about nature, including ourselves, i.e. our bodies, as part of it. It has no importance in the natural sciences and no longer plays a significant role in medicine. It has lost its function in nearly all important public spheres: communication, mobility, punishment, etc." From "The Loss of the Tactile," in Arno Bammé, Guenter Getzinger, and Bernhard Wieser, eds. *Year Book 2002 of the Institute of Advanced Studies on Science, Technology and Society* (Munich, Vienna: Profil, 2002): 229.

2 Seymour J. Mandelbaum, "Telling Stories," *Journal of Planning Education and Research* 10, no. 3 (1991): 210.

3 "Within this complex geography, telling stories create and destroy moral communities. As community designers, it behooves planners to attend to the telling." Ibid, 213.

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