



TOWN+GOWN

2011-2012

Action Research Agenda

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Icon Lexicon

- Active Design 
- Environmental Sustainability 
- Financial Sustainability 
- Infrastructure 
- Innovation/Technology 
- Risk Management 

Index of Agencies

Department of Buildings	DOB
Department of City Planning	DCP
Department of Citywide Administrative Services . . .	DCAS
Department of Cultural Affairs	DCA
Department of Design and Construction.	DDC
Department of Environmental Protection	DEP
Department of Health and Mental Hygiene.	DHMH
Health and Hospitals Corporation	HHC
Department of Housing Preservation and Development.	HPD
Department of Information Technology and Telecommunications	DoITT
Landmarks Preservation Commission.	LPC
Law Department.	LD
Department of Parks and Recreation	DPR
Department of Sanitation.	DSNY
Department of Small Business Services.	SBS
Department of Transportation	DOT
Mayor's Office	
• Capital Project Development	CPD
• Contracts Services	MOCS
• Environmental Coordination	MOEC
• Long Term Planning and Sustainability . . .	OLTPS
• Management and Budget	OMB
• Operations	OPS
New York City Economic Development Corporation	EDC
New York City Design Commission	DC

PREFACE

BACKGROUND:

In response to calls, from groups as diverse as the construction industry and the preservation community, to increase research activities in the built environment, the Town+Gown program embarked, in 2009, on a pragmatic and integrated approach, known as “systematic action research”, to increase applied research focusing on the particular physical setting of the City’s built environment. This *2011-2012 Research Agenda* is the program’s third research agenda.

The systemic action research methodology provides Town+Gown with a “learning architecture” within which system stakeholders can bring about change.¹ The built environment is a complex and dynamic social system where issues cannot be adequately comprehended in isolation from the wider system of which they are a part.”²

Town+Gown matches academics and practitioners to collaborate on research projects, the results of which will generate discussion and follow-up research aimed at making appropriate changes in practices and policies. This *2011-2012 Research Agenda* is the source for new research projects. Twelve research projects from the *2010-2011 Research Agenda* were completed at the end of academic year 2010-2011, joining the 13 research projects completed at the end of academic year 2009-2010.

In addition to facilitating partnerships between academics and practitioners on specific projects throughout the academic year, Town+Gown disseminates, within the Town+Gown community, the results of completed projects in its annual review, *Building Ideas*. Town+Gown will also commence a series of symposia within the Town+Gown community on topics raised by completed projects, so that we can collectively use research results to inform future changes in policy and practice.

FORMAT OF THE RESEARCH AGENDA

This *2011-2012 Research Agenda* is organized around the five academic disciplines—Management, Economics, Law, Technology and Design—that comprise the recognized multi-disciplinary field of the Built Environment.³ We have modified the Built Environment disciplinary model by combining the three Engineering disciplines with Architecture under the Design heading and by designating Urban Planning as a subsection under Management. The City’s physical built environment can serve as an ideal laboratory for those working in the many disciplines and fields that overlap with the Built Environment field. In the spaces where overlaps occur, productive academic research, informed by practitioner needs and skills sets, is possible.

There is a brief introduction to the issues under each discipline heading. There is also a companion background document, entitled *Orientation to Policy in the Built Environment*, that goes into greater detail on some of the more technical issues related to the Built Environment. See: <http://www.nyc.gov/html/ddc/html/design/tg.shtml> The placement, under a single disciplinary heading, of questions with a multi-disciplinary potential can obscure them from readers from various backgrounds. Thus, this *2011-2012 Research Agenda* places, by questions, “issues icons” designed to highlight the multi-disciplinary nature of questions.

HOW THE RESEARCH AGENDA WORKS

Systemic action research contemplates a non-linear process, with multiple perspectives and research methodologies over time. For this reason, the questions in this *2011-2012 Research Agenda* are intended to be broad, forming an umbrella research concept under which the schools and the agency partners can work together to craft problem statements leading to more defined projects that meet the needs of both the students and agencies, with specific deliverables. Experience during the last two years of the program has demonstrated that the questions are sufficiently broad and flexible to permit multiple projects and multiple methodologies. The flexibility present in the questions enables us to work with the schools to refine the questions as discrete projects that are appropriate for the particular programs and student skill-sets.

INTERESTED IN A QUESTION?

If you or your program is interested in working on one or more questions, please e-mail (matthewte@ddc.nyc.gov) or call (718-391-2884) Terri Matthews, Senior Policy Advisor at the New York City Department of Design and Construction and Director of Town+Gown, who will put you in touch with the appropriate staff from the client agency/agencies.

1. Danny Burns, *Systemic Action Research: A Strategy for Whole System Change* (Bristol: 2007), p. 1.

2. *Idem*

3. Paul Chynoweth, *The Built Environment Interdiscipline: A Theoretical Model for Decision Makers in Research and Teaching* (Proceeding of the CIB Working Commission Building Education and Research Conference 2006), <http://www.lawlectures.co.uk/bear2006/chynoweth.pdf>, pp.1-5.

MANAGEMENT

For the research questions under MANAGEMENT, the City acts primarily in the role of an owner. A critical objective for an owner is to align its interests in budget, schedule, safety and quality with those of its agents in construction who often have superior knowledge that increases during the pendency of a particular project. Since project needs, materials, building methods and information technology continually change “on the ground”, construction market participants adapt to such changes by using an evolving menu of service delivery methodologies as well as various management theories, techniques and tools, not dissimilar to those found in other industries or sectors. Finally, since some of the research projects below involve the City’s capital program and budget, separate analytical issues related to the City’s budget may be present in these questions. For more detailed background information related to MANAGEMENT issues, please see *Orientation to Policy in the Built Environment*.



How Can Risk Management Models Improve Construction Practices?

BACKGROUND:

Risk management is not a new practice. What is relatively new in risk management is that the complexity of modern life and the inter-relation of risks in a complex environment have transformed how organizations perceive and manage risk. The inter-related nature of risk in contemporary life increases the chance that failure, or dysfunction, in one area will have significant negative impacts in other areas. While not eliminating risk, modern risk management theory and tools can help an entity or enterprise acknowledge and evaluate the likelihood of malfunctions and mistakes and plan for them. Private sector enterprises have been using increasingly sophisticated risk management techniques. While public sector enterprises do not operate in a less complex environment, their use of risk management tools beyond insurance is not common, perhaps because they lack the direct incentive of the profit motive as well as indices of profitability.

The financial planning, the design and construction, and the operation and maintenance of long-lived physical assets involve sets of relationships in a shifting environment of unequal information and imperfect understanding. The capital programs of large public owners serve as the perfect setting to apply “enterprise risk management”—or ERM—a strategic framework for public owners to improve decision-making at all levels within the entity. ERM has been conceived as a multi-disciplinary approach by which an organization assesses—quantitatively where possible—controls, exploits, finances, and monitors risks from all sources for the purpose, in the private sector, of increasing its short- and long-term value. Applied in the public sector, ERM expands and integrates traditional risk management approaches across sub-units within the public owner entity, leading to decisions that take into account all risks facing the organization and, most important, the inter-relation among those risks.

QUESTION(S):

What has been the history of risk management in the construction industry from the middle of the last century until the present?

How can a public owner move from focusing on insurance, surety and traditional contractual risk allocation to an enterprise-wide approach to managing risk?

What lessons can a public owner learn from the private sector’s application of large program governance techniques and individual project governance techniques? From hospital systems’ application of healthcare risk management techniques?

What are best practices in enterprise risk management? What changes would be necessary for City agencies to implement such practices?

What would analyses of the City’s historical claims and litigation data suggest about long-term trends in construction-related risk? What types of things tend to go wrong on City construction projects?

What might an enterprise risk management analysis suggest for the City’s jobsite safety practices?

Based on the analyses above, what constitutes successful outcomes in construction and what seem to be preconditions for success?

Focusing on traditional risk practices, what are the trends among owners with large capital/construction programs, including trends in owner-controlled insurance programs, contractor-controlled insurance programs; surety and insurance products; contingency practice; damages for delay provisions and other claims management tools?

CLIENT AGENCY/AGENCIES:

HHC, Parks, DDC, Law

Why Does It Cost So Much to Build in New York—Public Projects?

For those cost drivers outside the City's control, how could the City develop risk management practices and feedback loops to eliminate or mitigate the impact of cost increases?

With a better understanding of the cost drivers, how could the City construct a City-specific model of cost increases for capital budget planning processes to complement the appropriate general cost inflator for the capital plan/10-year capital strategy periods?

How would insight from the City's actual costs enable City estimators to modify cost estimating practices to achieve better estimates?

BACKGROUND:

New York City construction costs have historically been the highest among all U.S. cities. Public construction cost increases are driven by a combination of market conditions and construction-related practices. It has also been suggested that there is a premium for public construction projects. Public construction programs must continue despite market changes, whether positive or negative. Those components of cost increases related to policies and practices that are not mandated by law present opportunities for public owners to contain or reduce costs. Understanding what actions public owners can take to contain or reduce costs would be critical to manage project budgets. Understanding the drivers of costs can help owners develop effective strategies to deal with turning points in the market when it changes from a buyer's market to a seller's market and then, as is inevitable, back again.

QUESTION(S):

After a literature survey on the drivers of construction costs, with a focus on public construction programs, the team would perform analyses of available cost data, including historical cost data at the agencies, to test hypotheses about the effects of public construction practices on construction costs.

Additional questions to be analyzed:

What is the relation of City-derived actual cost data to pricing curves established with aggregate data such as national and regional accounts?

To the extent drivers of increased costs are within the City's control (e.g., discretionary City processes and practices), how could the City reform processes and practices and/or develop strategies to minimize or contain cost increases over time? To what extent do the simultaneously multiple roles of the City—in particular, as an owner and as a regulator—contribute to drivers of cost?

CLIENT AGENCY/AGENCIES:

DEP, DPR, OMB, MOCS, DDC, Mayor's Office



How to Balance Cost and Quality More Effectively?

BACKGROUND:

The cost of a built thing reflects the cost of a particular combination of function, durability and aesthetics. Several possible combinations exist along a continuum of prices. The interplay between the owner's prioritization of the project's functions and the costs of such functions creates the value exercise, which is ultimately bounded by what the owner wants and is able and/or willing to pay. Value, the ratio of function to cost, can be increased by either improving the function or reducing the cost or a combination of both.

This exercise is part of the industrial production management discipline known as Value Engineering (VE), a systematic method to improve the "value" of goods and services by a rigorous examination of function. The City instituted its VE process in 1983, subjecting certain capital projects to the traditional "pause and look" VE process during the design process to provide an opportunity for all stakeholders to get a "reality check" on a project's functionality, cost and schedule. The impact of a VE review on project schedule varies and can be problematic for the schedules of certain projects, yet the ability of the VE process to bring "fresh eyes" and additional expertise to support projects during design can be beneficial.

Some feel that the designer, if properly performing, engages in "VE-like" analysis from the beginning of the design process, possibly rendering the VE process somewhat redundant. Moreover, some feel that not all the variables in the value equation are truly operable—or more specifically, that only cost reduction is operable at the expense of function and design priorities.

There are many design management methodologies used in construction, some of which come from the industrial design field and others which come straight from the construction field. They include Functional Analysis Conceptual Design (a variant of VE), Target Cost Modeling, Target Value Design, Total Quality Management, Multi-disciplinary Design Optimization, Lean Manufacturing and, from the U.K., Design Quality Indicators. The newest

entrants consist of a technological tool—Building Information Modeling—and a service delivery methodology—Integrated Project Delivery. The trend among all of these is the earliest and continuous application of the management techniques with as many stakeholders as possible.

QUESTION(S):

What would a literature survey on design management methodologies and tools suggest for public owners like the City?

How did VE, originally an industrial design technique, come to be used in construction, which shares some, but not all, attributes of industrial production?

What would case studies of various public owner VE programs suggest for the City, were it to attempt to resolve tensions from the application of VE to construction projects? What are best practices in design management?

What would a cost-benefit analysis of the City's VE program suggest for the City?

CLIENT AGENCY/AGENCIES:

DDC, OMB, Mayor's Office



How Can Public Owners Better Match Risk Shifting/Mitigation Strategies to Risk?

City use to improve jobsite safety practices on its own projects?

What options does the City, as regulator, have to improve job safety on all construction in the City?

CLIENT AGENCY/AGENCIES:

DDC, Law

BACKGROUND:

The financial planning, the design and construction, and the operation and maintenance of long-lived physical assets—vertical structures or horizontal infrastructures—involve sets of relationships in a shifting environment of unequal information and imperfect understanding. Public owners, like all owners, bear the ultimate responsibility for a capital project—from program definition to payment to commissioning and long-term operation and maintenance—and are concerned with budget, schedule, safety and quality, in a milieu that is the poster child for asymmetric information. The costs, for example, of failing to prevent construction workplace safety risks, can be significant in the context of a public owner's annual expense budget. Thus, a critical objective for an owner is to increase the chances of aligning its interests in budget, schedule, safety and quality with those of its agents in construction, the designer and the contractor, who often have superior knowledge about the owner's project. Risk management methodologies, most often used by private sector enterprises to assess and manage risks across entire corporate operations, can be useful tools to help public owners identify opportunities to make their capital programs more efficient, beginning in the capital planning process, including the project development process, and ending with the project commissioning process. Risk management tools focusing on improving workplace safety on the construction job site can reduce the risk of harm to life and property as well as manage the risk to the budget.

QUESTION(S):

What would a survey of risk management practices, in general and specifically in construction planning and execution, at large owner organizations, either public or private, reveal for public owners such as the City?

What strategies can public owners use to better manage risk in construction, from planning to project operation and maintenance? In particular, what strategies can the

How Do Public Agency Construction Practices Vary and What Is the Relation of Variance to Cost and Schedule?

BACKGROUND:

While the 1979 Model Procurement Code influenced the City's procurement provisions in the Charter, State public construction law prevents the City from utilizing some of the more flexible procurement tools included in the Charter. The City's construction-related procurement rules further integrated the Charter with State law.

As a result, some project management methods commonly used by private owners, as well as public owners governed by different laws and regulations, such as the Design-Build and Construction-Management-at Risk service delivery methodologies, are not widely used by City agencies.

However, other construction contracting practice variations that fall squarely within the parameters of State law and City regulations may also have significant impacts on City agencies' performance in project execution. These include variations in the roles played by construction managers and resident engineers, as well as variations in the use of pre-qualification, a tool that is now more widely available as a result of a recent change to State law. While several steps in the process are prescribed Citywide by the regulations, internal operational approaches to execution can differ among agencies.

All of these practices, especially those used by public owners in other jurisdictions, may give the City insight into feasible ways to streamline the contracting process, while promoting the Model Procurement Code's—and the City's—procurement values. While these additional methods may require changes to State law, the City has been hampered in its efforts to pursue greater flexibility in State law by the absence of reliable data concerning the savings and other benefits potentially to be derived from their use.

QUESTION(S):

What are the variances in practice among City agencies that procure large-scale construction services?

What would a comparative analysis of operational practices in the contracting process reveal?

Working from the comparative analysis of City agency practice, what is the relation of agency practice to project performance—schedule and budget?

What would a survey of practices by other public owners that have adopted 1979 Model Procurement Code provisions reveal as possible options for the City to consider, either within its current legal framework or in the context of legislative reform?

CLIENT AGENCY/AGENCIES:

DCAS, DSNY, Parks, EDC, MOCS, DDC, Mayor's Office

How to Manage the Impact of Capital Budget Politics on Project Costs and Execution?

BACKGROUND:

Since there are many components of cost increases for public projects, one issue in evaluating cost increases is deciding when, during the capital-planning-to-project-execution continuum, it is appropriate to establish the baseline measure of cost estimates upon which to evaluate the increase in costs. Unlike the private sector, in which decisions about whether and how to do a project are completely private, in the public sector, the planning and execution of public projects take place in a public and politicized process.

The City's capital budget process anticipates a post-adoption process of increasing understanding of the project, which often increases the project estimates figures, yet the public often views these increases as evidence of public sector incompetence. But a process that permits more projects into the capital budget due to unrealistic initial cost estimates results in slowing them all down, on the margin, as funds to make up the difference need to be found, usually from other projects, resulting in the delay or elimination of projects which may by then have a public constituency. Further, agreements with the surrounding community about related amenities can exacerbate the upward slope of project costs. Moreover, some academics have suggested the politics of capital planning extend to the purposeful underestimation of costs and overestimation of benefits in order to obtain political buy-in from the taxpayer public.

Since it is not possible or desirable to eliminate the politics of capital planning and budgeting, developing a better understanding of the impact of politics on the capital program might, however, enable public owners to craft capital plans and budgets that better reflect the impacts.

QUESTION(S):

How can the City develop a reference-class forecasting model for its existing capital program process?

What are the political forces and/or project characteristics that determine whether a project is included in the capital plan and/or budget?

What are the political forces and/or project characteristics that determine whether a project is executed through project completion?

By what characteristics can capital projects be grouped to determine patterns in over- or under-budgeting?

CLIENT AGENCY/AGENCIES:

DEP, OMB, DDC, EDC

COMPLETED PROJECTS:

Gary Bennett, *Deconstructing the Articulated Ensemble: Analytics and New York City's Capital Budget* (New School/Milano: 2011) and Laura Foster, Zaynab El Bernoussi, Hideto Hakamada, Aurora Hui and Mio Washizu, *NYC Capital Budgeting: The Impact on the Operating/Expense Budgets* (Columbia/SIPA: 2010)

How to Increase Project Planning and Scheduling Certainty?

How might the City design a quantitative model to evaluate the impact of internal and external environment changes on project schedule?

What are best practices among public owners and large institutional private owners to manage schedule volatility?

CLIENT AGENCY/AGENCIES:

CPD, DDC, OMB

COMPLETED PROJECT:

Maira Ayala, Robert Han, Junji Kolke and Milagros Lecuona, *Increasing Project Planning and Scheduling Certainty for Critical Construction Projects* (Columbia/SIPA: 2011)

BACKGROUND:

Understanding the overall timing of a project – how long it will take a public agency to move from “idea” to “building” to “completion” – and what factors influence decision-making as well as actual project execution would help the City better estimate a project’s schedule and better plan its capital program. Elected officials frequently make commitments to constituent groups to deliver certain projects – for example, libraries, firehouses, improved streetscapes, parks. Yet the insufficient level of understanding of project scope and client needs when the project first surfaces in public, often before or at budget adoption, results in unrealistic estimates of cost and schedule and corresponding unrealistic expectations which construction agencies are thus often in the position of not meeting. The complexity increases when projects involve more than one City agency or participation by other levels of government or private sector organizations.

A seminal study observed that, among the many factors that cause change in project schedule and costs, changes in the macro-environment of a project is a key determinant. The macro-environment for a project generally includes the political, economic and cultural environment, within which applicable laws and regulations, labor practices, and prices operate to impact schedule and costs. The study also noted that regulatory requirements imposed by government have a significant impact. For private projects, the “government” is always an external factor, but for public projects, the “government” is not always external and is, to some extent, controllable.

QUESTION(S):

Based on research and analyses performed in 2011 that included a literature survey, interviews quantitative analyses identification of data gaps, process analysis and mapping, what are the next steps to create a risk simulation model to predict schedule and budget volatility?



What Is the Impact of Design and Materials Standards on Construction Costs?

CLIENT AGENCY/AGENCIES:

CPD, DDC

BACKGROUND:

The City has, from time to time, attempted to manage costs by imposing certain design and materials standards on its projects. OMB has attempted this in construction standards it has issued, and certain agencies with large numbers of a certain building type, such as DDC and the School Construction Agency, have implemented design and materials standards for some of their programs. There is the risk, however, in the bureaucratic environment of large public owners, that standards once issued may not change quickly enough to take advantage of innovative design and construction techniques and new materials. The risk is that static standards may, at some point, fail to contain costs and account for marginally more costly buildings than are possible immediately after the standards are released.

QUESTION(S):

What would a literature survey on the use of design and construction standards in both public and private sectors suggest for public owners like the City?

What are best practices among public owners and large institutional private owners? To what extent do these best practices address the ability of a large public owner to change standards to reflect current practices and materials?

To what extent do a jurisdiction's various building related regulations serve as default standards?

In view of the City's practice with standards, it may be possible to conduct a quantitative analysis of the effects of standards on costs. Based on the qualitative analyses above, how might the City design a quantitative model to evaluate the impact of standards over time?



How Do Other Cities Do It—Pro-active Infrastructure and Building Maintenance?

BACKGROUND:

The task of maintaining public infrastructure and buildings is technically difficult and subject to competing forces including the political benefits that accrue to visible new and expansion projects. On the technical side, however, some jurisdictions are using protocols to inspect and evaluate existing infrastructure on a regular inspection cycle, using software to evaluate/compare previous inspection results and to estimate when repairs will be needed to prevent failures. The City is interested in learning more about what has been effective elsewhere.

QUESTION(S):

What would a literature survey of infrastructure assessment techniques and technologies suggest to public owners such as the City?

How do other agencies and local governments in the State and across the country evaluate infrastructure asset condition and what protocols do they follow?

What available technologies are best suited for infrastructure and building condition assessment?

How effective have these protocols been; specifically, how well have they projected rates of deterioration?

CLIENT AGENCY/AGENCIES:

DDC



What Tools Have Been the Most Successful in Enabling Agencies to Better Manage Scope Changes as Large-Scale Capital Projects Evolve?

BACKGROUND:

Change is an inevitable part of capital construction projects. Changes to projects have cost implications, rarely resulting in lower costs. Thus, it is imperative for the owner to understand and manage change at all times during construction. The City's capital budget process explicitly expects and is set up to accommodate change from project inception (at budget adoption) through the bidding process and beyond. The Charter includes a capital project "road map" with stages that each capital project must follow. This process expressly assumes that projects change over time, and it is in the interest of project budget and schedule to anticipate and manage such change.

QUESTION(S):

What is the menu of change management techniques in use across City agencies and what has been their impact on cost and schedule?

What are best practices in both private and public sector construction and what would City agencies need to do in order to adopt them?

CLIENT AGENCY/AGENCIES:

MOCS, EDC, DDC, Mayor's Office, OMB



Future Workforce Needs and Development—Sources for Future Construction Professionals and Skilled Workers?

needs to be trained to meet recent and planned environmental regulations and what is the current supply?

CLIENT AGENCY/AGENCIES:

DDC, MOCS, SBS, OLTPS

BACKGROUND:

There are concerns about the adequacy of the supply for all construction professions and trades. For example, the City, one of the largest consumers of engineering services, has depended on professionals from other countries for some of its supply of civil engineers. This source is subject to demand from these other countries, which have increased opportunities as a result of their own development, as well as from adjacent areas where development has also increased. The U.S. is no longer the most attractive buyer of engineering services.

The recent increase in environmental sustainability legislation is creating the need for new skills and increasing demand for existing skills. What can the City do to look ahead and work with the local professional and trades institutions to make sure that there is adequate construction staff available over the long term? How might the City examine its professional staffing requirements over the next several decades and plan the steps necessary to insure the maintenance of capital management excellence? What steps can the City take to match construction workforce supply with demand?

QUESTION(S):

What would a literature survey on the demand for and supply of construction professionals and trades suggest for public owners like the City?

What do other agencies and local governments in the State and across the country do to attract and retain construction professionals and trades in public sector work? What are best practices?

What would a series of interviews at professional and trades schools suggest for public owners?

To what extent does the City's increase in "green" built environment regulation impact the supply and demand for construction professionals and skilled workers? Who



How to Bridge Organizational Divides to Create Culture of Innovation within Built Environment Agencies?

BACKGROUND:

It has become axiomatic that there is insufficient research in the built environment field. Problems in “informational transfer” abound, further complicating the ability to do effective research. Divides exist between academia and practitioners and within practitioner organizations. Focusing on the large public owners, one can see the divides that typically occur within large public bureaucracies, with vertical, hierarchical structures of command and control, applied to the built environment milieu. In addition, for public owners, divides between the “permanent government” and elected administrative apparatus over the long term can operate to dim institutional memory. The inability of knowledgeable agency staff to translate institutional memory effectively up the agency hierarchy and to elected officials every time an issue arises may be, in part, due to the complexity, the obscurity and technical nature of some issues, surrounded by a conventional wisdom that is as fragmented as the state of formal analysis in this area.

QUESTION(S):

What are non-technological obstacles that prevent effective information transfers up and down the hierarchy within a public built environment agency that can then serve as a source of strategies to increase information transfers and make institutional memory more resilient?

What techniques are available to large government systems to bridge divides and move toward “smart” or “more informed” development and execution of capital programs?

CLIENT AGENCY/AGENCIES:

DDC

How to Evaluate Contractor Capacity to Undertake Public Projects?

BACKGROUND:

Despite the presence of large firms in the construction industry, the predominant business model for construction firms is the small business. There are two views on the prevalence of small businesses in construction. On the one hand, it may be socially beneficial to have small businesses, often emerging businesses, participate in the industry, growing over time. On the other hand, it may be viewed as an economically inefficient mode of industry organization. The organizational and capacity issues facing emerging and growing contracting firms are not unlike those facing emerging and growing not-for-profit service organizations. From the public owner's perspective, however, there are practical issues inherent in assessing the capacity of small businesses to work on large and/or complex projects. Further, under State law governing public construction procurement, while there are limits on how a public owner can disqualify a potential winning bidder, there is an ability to pre-qualify bidders.

QUESTION(S):

In view of current methodologies to analyze the capacity of organizations, the composition of the local construction market and the needs of projects in the City's capital program, how might City agencies design tools to assess the capacity, including financial capacity, of vendors to perform on various public projects?

CLIENT AGENCY/AGENCIES:

DDC, MOCS, SBS



What is the State of Building Information Modeling and Integrated Project Delivery in Public Sector Construction?

BACKGROUND:

Some design management techniques and project management tools emerged from the industrial design field and were applied to construction, while others emerged from the construction field itself. Despite their different origins, successful techniques share a basic precept that the earliest practicable and continuous application of these techniques, including all relevant participants and stakeholders in the process, works best for the project at hand. The newest entrants to the firmament consist of a technological tool—Building Information Modeling or BIM—and an innovative service delivery methodology—Integrated Project Delivery or IPD.

BIM originated from parametric solid modeling (PSM) software used in the automotive and aerospace industries, and as these software platforms evolved and became less expensive, they migrated into the field of physical structures. BIM can hold large amounts of data—spatial, schedule and cost—permitting users to explore various building designs at the earliest possible stage as well as the inter-relationships among design, constructability, schedule and price. Public owners have been using BIM, though their ability to fully exploit its benefits is limited when a public owner can only use the design-bid-build methodology which imposes a temporal divide between the designer and contractor.

IPD is an innovative relational contractual arrangement in which the owner, designer and contractor, manage project risk by contractually sharing, as early as possible in the life of a project, responsibility, risk and reward. Public owners constrained by public bidding requirements that preclude vendor selection based on value as well as contract negotiation, cannot use this innovative methodology in its pure state.

QUESTION(S):

What would a survey of large public owner's use of BIM and/or IPD reveal of public owner adoption of BIM/IPD?

What is the relation of BIM and IPD use in the public sector to existing tools and techniques currently in widespread use?

How do public owners constrained by law utilize features of either BIM or IPD? How do current laws impede adoption of IPD principles, and full use of BIM technology?

What has been the relation of BIM to IPD on public projects?

What has been the experience of owners—private owners and especially large public owners—that have embraced either or both BIM and IPD?

To what extent have the building professions and trades, embraced BIM and IPD?

How can public owners implement BIM, IPD and life-cycle operation and maintenance in a lowest competitive bid/design-bid-build statutory environment?

How can public owners better integrate BIM and its related design and construction software packages into the design process?

CLIENT AGENCY/AGENCIES:

DDC



What Can Public Built Environment Data Tell Us?

BACKGROUND:

Public owners as governmental entities collect data as part of the various processes they manage from the organic processes of government itself to the regulation of both public and private sector entities within their jurisdiction. Analyses of routinely collected data, especially data collected over a long period of time, can tell us things we did not think to study earlier. Analyzing data initially not collected for the purposes of research can be challenging, but, hidden in the trove of unexamined data may be treasures.

The City's built environment data includes cost-related data and performance-related data. The City's various built environment regulators also collect process-related data that can be relevant to cost and performance analyses.

On the cost side of the divide, there is a panoply of studies that could be replicated using City project-specific data, once it has been catalogued and analyzed, identifying data gaps that might be compensated by proxies, outside data or specific surveys. For example, there are studies analyzing the relation of prices bid to predatory bidding as well as to the magnitude of change orders. There are studies analyzing the relation of original cost estimates to final costs, implicating elements of the politics of public construction. There are studies analyzing the relation of initial project and/or life cycle costs with service delivery methodologies. There are also studies analyzing the costs associated with negotiated construction methodologies and with auction-based construction methodologies, suggesting aspects of appropriate construction contract design to align principal and agent interests in a situation of incomplete information, the definition of a construction project.

Recently enacted and proposed environmental sustainability legislation has increased the need to understand the performance side of the divide. Once the data cataloguing has been completed, current legislation requires developing citywide standards for data the City collects

on capital projects, buildings, energy use as well as possibly other sustainability metrics, as well as a meaningful centralized approach for tracking energy and sustainability data as the City complies with its sustainability laws.

QUESTION(S):

Focusing on either the City's built environment cost data or the performance data:

What would a survey and cataloguing of such data suggest?

Based upon the surveys above, what would the most effective strategy be the City to pursue to systematically analyze such data to illuminate the nature of its practices, policies and mandated processes?

After identifying data gaps to address analytical needs, how should the City deal with creating appropriate data going forward?

CLIENT AGENCY/AGENCIES:

DDC



How to Improve Built Environment Performance Data Metrics and Systems to Support the City's Sustainability Agenda?

BACKGROUND:

The City is in the midst of developing the Sustainability, Energy, and Property Tracking System (SEPTS). This building database is primarily intended to facilitate the collection and aggregation of the data needed to monitor and manage the implementation of several environmental laws affecting municipal buildings that have passed in recent years. These laws, along with other initiatives, include requirements to reduce GHG emissions from city operations 30% by 2017, to benchmark larger buildings each year using the EPA Portfolio manager protocols, to replace inefficient HVAC equipment, to require that larger city projects achieve a LEED rating, and others. In the process of designing and implementing SEPTS, the City has elected to customize a product by TRIRIGA, the software developer.

SEPTS represents the first time the City has attempted to use a web-based tracking system to collect building related data into a central system so that relevant data may be viewed, entered, and aggregated according to the needs of personnel with an interest in one or more or even all of the city's buildings. Examples of such user personnel range from policy makers in the Mayor's Office to building operators charged with operating a single building more efficiently. Users include agencies that manage capital projects, those that administer the above referenced laws, those that are responsible for the efficient use of leased and city-owned space, and even those that must count trees planted and removed, or that need to track the location of fuel oil tanks.

Historically, each agency has developed its own internal database to collect and track one type of data specific to its mission, such as building maintenance, for a subset of all the city buildings, such as schools, while another develops an entirely separate database for another or overlapping group of structures in order to keep track of another category of data. This often leads to a significant duplication of effort. It also results in a lack of coordination on a number of levels and makes it difficult and time consuming, if not impossible, to collect and aggregate

the detailed data needed to successfully manage the implementation of the city's environmental laws and the performance of the city's 5,000 buildings over time.

QUESTION(S):

What are the problematic fields in the SEPTS data dictionary?

What would be the most effective standard definitions to permit a city-wide approach? to permit alignment with national standards and methodologies?

What would be the most effective management solutions to support a City-wide change in definitions and measurement?

CLIENT AGENCY/AGENCIES:

MOEC, LTPS, OMB, DoITT, DOB and DCAS



How to Improve Jobsite Safety Practices?

CLIENT AGENCY/AGENCIES:

DDC, Law

BACKGROUND:

Mandating an appropriate level of safety—to the general public and to the construction participants—is an objective of many built environment regulations. The public and private owner's contract documents and the financing documents under which the private owner borrows also impose risk management requirements to manage the risk to life and property during the construction process. There is a cost to ensuring jobsite safety and a cost to failing to ensure job site safety, sometimes both occurring on the same project. In order to get a handle on the risk management of jobsite safety, it is important to understand the nature of job site safety practices and how to improve them.

QUESTIONS:

What construction safety practices have been shown to be most successful?

To what extent are 'best practices' 'universal' in nature?

Are there particular practices of importance in certain kinds of project but not others?

What changes in current New York law and current New York regulations could be implemented that would encourage 'best practices'?

What would analysis of reportable injury rates data reveal for government as regulator and as owner?

What is the relationship of leadership to the application of best practices?

How might the City revise regulations to increase the chances of best practices at both private and public projects and/or revise its construction contract to increase the chances of best practices on its own projects?



How Can Owners Keep Their Standardization Practices Current and Effective?

BACKGROUND:

Public owners, such as the City, have turned to design and materials standards and, in particular, standard specifications contained in bid documents to attempt to manage costs and quality. There is the risk, however, in the bureaucratic environment of large public owners, that standards, once issued, may not change quickly enough to take advantage of innovative design and construction techniques and new materials. The bureaucratic tendency is compounded in an industry that has historically been slow to adopt innovative methods and materials. Failure to update standards increases the risk that static standards may, at some point, fail to contain costs and/or maintain a certain quality.

QUESTION(S):

What would a literature survey on the use of design and construction standards in both public and private sectors suggest for public owners like the City?

What are best practices among public owners and large institutional private owners in adopting and updating standards? To what extent do these best practices address the ability of a large public owner to change standards to reflect innovations in practices and materials?

To what extent would standard specification practices from the industrial design world be applicable to construction in general and public construction in particular?

What is the relation of building regulations and standards practices at both public and private owners?

CLIENT AGENCY/AGENCIES:

MOCS, DDC



How Can Public Owners Embrace Life Cycle Costing?

BACKGROUND:

To the untrained observer, it would seem that the public sector has historically turned a blind eye to life cycle costs. Outmoded conceptions of the construction product, participants and process inform current public construction and finance laws, creating disconnects in the practices of public owners. These outmoded statutory schemes are often not within the control of some public owners. For example, outmoded statutory schemes that control local government activities are often creations of higher state law, leaving some public owners unable to change practice effectively. Other processes and practices are within the public owner's discretion, but politics intervene and discourage policy and practice improvements.

The rational public owner, and equally the rational taxpayer, should want the public owner, or government, to provide school buildings, road and bridges, drinking water and waste water treatment facilities and their related services over many years, necessarily implying that operation and maintenance costs after initial construction costs must be paid. Yet many factors conspire against the explicit and early assumption and planning for such life cycle costs as part of the initial public investment decision processes. First, some public procurement laws requires a focus on initial costs only. Even the most sophisticated long-term financial planning systems only project out for five fiscal years, too short a period to effectively link the projected operation and maintenance costs to the expense budgets outside the plan period. The politics of capital projects may further conspire to overestimate benefits and underestimate the costs, whether initial or life cycle, of proposed projects. Finally, for existing infrastructure, the estimates of state of good repair activities, done correctly, may overwhelm capital budget resources, crowding out the politically popular new and expansion projects. Public finance techniques available to local governments may exacerbate capital program volatility. What's a public owner to do?

QUESTION(S):

What would a literature survey on large public owners, across the country and outside the U.S., related to financial sustainability concerns, suggest for public owners like the City?

What are best practices among large public owners, both across the country and outside the U.S.?

What public finance vehicles, including the utility-fee model and the impact fee model, are in use across the country and to what extent do particular vehicles align with types of projects and uses?

Since legal and policy-based restrictions on the use of capital and concession-derived funds for life-cycle funding vary across jurisdictions, a separate analysis of such restrictions would be helpful.

What kinds of statutory changes—at both State and local levels—would be required for the City to implement these identified best practices?

What elements of the public-private partnership methodology can be applied to the traditional processes of planning, financing, construction, operation and management of public capital projects and how?

What is the relation of systemic deferred maintenance investment and capital-funded renovation/expansion projects?

How can public owners effectively balance state of good repair capital needs with needs for new and expansion projects?

CLIENT AGENCY/AGENCIES:

DDC, OMB

COMPLETED PROJECTS:

Carrie David, LaVickie Jones, Edna Marinelarena, Jennifer Proulx and Yvonne Wang, *Transitioning into Lifecycle Cost Analysis* (NYU/Wagner: 2011); Mathew Dudley, *The Effects of Preemption and Dillon's Rule on Municipal Home Rule in NY: Limiting Public Construction Contracts to the Design-Bid-Build Service Delivery Methodology and Public Works Service Delivery Methods* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2010); and Cecily Goodrich, *Statutes for Public Construction* (chart) (Brooklyn Law School/Clinical Program: 2010)



How Can the City Apply Life Cycle Costing to Its Street and Public Space Programs?

BACKGROUND:

The City is at the forefront of the nationwide shift to a more effective and holistic approach to funding, building, maintaining and managing streets. At the root of this transition is the recognition that every street serves a number of functions beyond the movement of vehicles. The reliability of any project assessment depends on the use of criteria that accurately reflect a street's particular functions while drawing on reliable cost and durability data for materials under consideration. At the same time, in the design and construction of its streets and public spaces, the City seeks to use materials that are high-quality, durable, and cost-effective. As the natural environment consists of various inter-related systems, the way the City thinks about its built environment and how it funds it must mirror such inter-related systems.

As the result of prior analyses performed during a 2010-2011 Town+Gown project, the City now has a model for life cycle costing of environmentally sustainable streets and public spaces as well as some data and identified cost data gaps. As a general matter, these data gaps arise from the City's organizational structure and budget process that do not support the cross-systems approach demanded by environmental sustainability. For example, cost data for post-completion maintenance expenses may be spread across a variety of agencies, with varying degrees of specificity, and not with the agency that constructed the infrastructure. The City's recent experience with cross-systems thinking on storm-water issues may serve as a model for other infrastructure types with similar environmental cross-systems aspects. But some of the data gaps could be filled immediately with follow-up research extrapolating from available data collected for other purposes. Projects undertaken for this question would take the recently-completed work to the next level.

QUESTION(S):

After identifying data gaps to address analytical needs,

how should the City deal with creating the appropriate data going forward?

What options are available to the City to deal with data gaps? Would non-City data sources provide usable data? Are there proxies available in existing City data? What kind of survey techniques might be appropriate?

What useful data is already being collected and/or studied across the City agencies?

What already-available data could become more broadly useful through minor changes to current processes for gathering, cross-agency dissemination and analysis?

Since streets and public spaces are one example of the many cross-systems that exist, how should the City go about developing citywide standards for measuring operation and maintenance costs as well as project performance across agencies? What kind of measures would be appropriate for city-wide application?

CLIENT AGENCY/AGENCIES:

DOT, DEP, DDC

COMPLETED PROJECT:

Carrie David, LaVickie Jones, Edna Marinelarena, Jennifer Proulx and Yvonne Wang, *Transitioning into Lifecycle Cost Analysis* (NYU/Wagner: 2011)



How to Modify the Practice of Pre-Qualification to Increase Quality in Construction?

Massachusetts, that make pre-qualification a central feature/active tool of their public construction procurement process?

How do other jurisdictions establish where to put the floor in order to raise the quality of construction work by raising the quality of those qualified to work on projects?

CLIENT AGENCY/AGENCIES:

MOCS, DDC

BACKGROUND:

State law change in 2008 permits New York public owners to pre-qualify public works contractors prior to bidding. Putative benefits of pre-qualifying contractors, within the traditional competitively bid design-bid-build model, with the award to the bidder with the lowest price, include permitting the owner to consider qualifications, experience and past performance, prior to bidding, thus increasing the chance that selected contractors are capable of providing quality construction. In practice, however, instead of significantly raising the bar for quality contractors on a project, the practice of pre-qualification tends to merely assure a minimum threshold.

Across the country, however, there exists a wide variation in practice, in part reflecting the historical adoption of the various versions of the Model Procurement Code. The initial 1979 Model Procurement Code's embedded a statutory preference for competitive sealed bidding, but permitted variation when circumstances required it. The later 2007 Model Code for Public Infrastructure Procurement expressly eliminates this statutory preference and specifically authorizes multi-step sealed bidding within the competitive sealed bid context to provide flexibility in meeting public needs. These changes make it possible for public owners to focus on construction quality even within the competitive design-bid-build model.

QUESTION(S):

What would a survey of the pre-qualification practices at public construction agencies across the country reveal?

What would a survey of low-bid approaches across the country reveal?

Of the practices surveyed, what practices tend to increase the chances of raising the bar for quality contractors rather than establishing minimum qualifications?

What has been the experience of jurisdictions, such as



What Are Best Practices for Measuring and Evaluating Capital Project and Capital Program Performance?

BACKGROUND:

Public owners that both finance and construct their capital programs measure the performance of individual projects as well as the capital program as a whole. The public's understanding of either the construction process or the capital budget process is limited at best, latching on to certain broad process measures that resonate with them despite the fact that these measures may obscure individual project issues or be at odds with project needs. For example, the City's current published citywide capital program data are process indicators. The commitment plan is a planning tool and most existing indicators, with exception of procurement indicators, relate to this planning document. The adage "what get measured, gets done" can sometimes serve as a warning. To the extent a public owner measures agency performance pegged to the overall capital program process, as the "percentage of commitment plan completed" indicator, but not other project metrics such as cost, schedule, safety and quality, the other performance objectives may suffer. Measuring these other performance objectives in a meaningful way may help agencies improve practices to better manage what they can, exposing those variables due to external conditions beyond their control as well as those for which the owner as regulator may be responsible.

Finally, at a higher level, what constitutes a project's success or failure depends on the perspectives of the stakeholders who are being asked to evaluate it, or whose perspectives are deemed to matter from the professional manager perspective.

QUESTION(S):

What can case studies, told from multiple viewpoints, of completed, stalled and aborted public projects suggest to public owners about the broader context in which public programs and particular projects could be evaluated for success or failure? What are best practices for measuring individual construction project performance?

What are best practices for measuring capital program performance?

How do large, sophisticated public owners manage the relationship between the two types of performance measures?

In an attempt to move beyond metrics for individual projects, a set of projects from any particular administration or from any particular financial plan period or business cycle, what longer-term and broader metrics are available to take in the City as a whole? What longer-term and broader metrics should be included in future analyses of the City's capital program?

CLIENT AGENCY/AGENCIES:

DDC



How to Bring the Municipal Workplace—Service Delivery and Administrative Spaces—into the 21st Century?

Linking the issues of workplace performance, enhanced service delivery, financial efficiency, environmental sustainability and existing technology, what could the municipal workplace look like in 20 years? What are the near-, intermediate- and long-term objectives for such an evolution? What appropriate strategies can the City pursue to achieve them?

CLIENT AGENCY/AGENCIES:

DSNY, DDC, DCAS

BACKGROUND:

The City has been developing an awareness that the design of workspace—as a place where City employees spend a significant portion of the week and as a place where the public interacts with government—has a direct relation to the provision of public services. Moreover, budget constraints have forced an awareness of publicly owned and leased spaces from a City-wide financial perspective. The City's sustainability agenda has generated both an awareness of the interconnectedness of human activity and the environment, further generating creative solutions to reducing greenhouse gases and carbon footprints. And, finally, computer technology is at a point where it can support a variety of organizational structures and permit flexibility within them so that bridging siloed sub-units within a large organization over a large geographical space, the scourge of organizational efficiency and effectiveness, is no longer science fiction, but is now possible. Private sector organizations have been making strides in all of these areas, oftentimes simultaneously. Yet, at least in the immediate local area, there has been no attempt to link these lines of development into a holistic vision of the municipal workplace in the 21st century.

QUESTION(S):

What would a literature survey of the relation of workplace design and performance in both public and private sectors suggest for a public employer and public owner such as the City?

What municipalities have experienced success in moving away from 20th century models of municipal workforce organization and service delivery in ways that are represented in built environment and in spatial terms? How did they achieve such success?

What are the real constraints—in statute and in practice (which may be related)—to adopting current private sector practices?



Who Does What on Construction Job Sites?

What are the historical antecedents to current job titles and functions?

CLIENT AGENCY/AGENCIES:

DDC, Law

COMPLETED PROJECT:

Timothy Kane, *Construction Licensure Schemes in New York and Construction Licensure Analysis* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2011)

BACKGROUND:

The construction project is the poster child for information asymmetry—a complex process where the archetypal actors—owner, designer and contractor—attempt to cooperate while attempting manage risk, often by shifting risk away from themselves. Of the three archetypal actors, two—the designer and the contractor—are regulated with respect to the services they provide on the project. The state and local levels of government have various roles in the licensing scheme. Job site processes are influenced by historical practices as much as, if not more than, governmental regulation, so it is important to understand the origins and organizations of the trades and the professions. What happens on a jobsite may have roots in the master builder model from before the period of industrialization, as well as from the medieval guild model even further back in time. Past models and relationships may still be relevant and explanatory.

The most recent service delivery innovation, Integrated Project Delivery, requires the archetypal actors to manage risk on construction by contractually sharing, early in the life of a project, responsibility, risk and reward. Further, there has been greater interest in refining licensure regulations for safety purposes. Success in either endeavor requires understanding the differences among the licensing schemes, their historical antecedents and their economic implications. Building on a foundational legal analysis of the regulation of built environment participants in New York City, this project would focus on creating a reality-based taxonomy of who does what on construction sites. This taxonomy would permit a variety of analyses.

QUESTION(S):

What does a full taxonomy of who does what on construction job sites suggest for public policy?

What is the relation of actual jobs and responsibilities to the licensure pattern as well as to job safety regulations?



Quantitatively-Based Investigations into Active Design

CLIENT AGENCY/AGENCIES:

DHMH, DDC

COMPLETED PROJECT:

Xiao Yi Chen, Serdar Oztopal and Roberto Pesquera, *Long-Term Capital Investment and Green Construction in New York City* (Columbia/SIPA: 2010)

BACKGROUND:

Historically, built environment design has achieved positive public health outcomes, from the public water and parks systems, the public sanitation program to housing and zoning laws. In the latter part of the 20th century, built environment design initiatives have ranged from developing pollution control features on factories (and cars) to eliminating toxic compounds from building materials such as asbestos and lead. At a time when the cumulative effect of contemporary planning and design have reduced the need for daily physical activity, public health researchers are now exploiting the relationship between built environment design and public health outcomes in the quest to reduce the incidence of obesity and its related chronic diseases. Physical activity has been found to prevent a host of chronic conditions. To illustrate, parks once provided respite from the week's strenuous labors, and now they must be designed to provide situations for physical recreation, because jobs are sedentary and people commute from home to jobs in a variety of powered vehicles. Contemporary building design—both commercial and residential—has reduced the number of opportunities for people to make up the slack in their physical activity. Active design principles in building design and in planning can increase the opportunities for daily physical activity that can help reduce the incidence of chronic disease.

QUESTION(S):

How would one design a cost-benefit model to test the impact of the City's Active Design Guidelines applied to various building typologies on building users' health status? What data exists to apply to the cost-benefit model described above? What data would need to be included in a survey to round out the necessary data?

How would one design a model to compare, over an appropriate time-frame, the cost-benefit paradigm for expense-funded wellness programs with the cost-benefit paradigm for capital-funded active design projects?



How Can the City Apply Sustainability Principles to Its Fixtures, Furnishings and Equipment Program?

BACKGROUND:

The impacts on the environment of permanent building materials and construction and demolition waste management have been widely studied and are more generally known among practitioners and policymakers. Less widely studied, and known among practitioners and policymakers, is the impact on the environment of fixtures, furnishings and equipment (FF&E), those significant, but less permanent, items that attach to the inside of, or are housed within, permanent buildings. FF&E is an umbrella term referring to movable furniture, fixtures or other equipment that have no permanent connection to the structure of a building. Examples of FF&E include desks, chairs, computers, electronic equipment, tables, bookcases, and partitions. FF&E affects the environment no less than the buildings in which they are housed, for example, having impacts related to indoor air quality (IAQ), energy performance, health and well-being, and solid waste management. The City purchases significant amounts of FF&E for its new construction and renovation projects, yet, at present, neither the FF&E purchasing process nor the FF&E maintenance process reflects environmental sustainability principles. Further, the design and construction process, as required by the various contracts with City construction agencies, such as DDC, does not reflect environmental sustainability principles. FF&E purchasing is often finalized towards the end of the construction phase, when design consultants are typically available on a limited basis and when scheduling concerns predominate. Due to the paucity of literature on the subject, which is matched by the plethora of products marketed with self-identified “green” attributes in an unexamined area, design consultants making these selections are also without much guidance in this area.

QUESTION(S):

What would a literature survey of FF&E impacts on the environment, both external and internal, reveal for the City, as a public owner and as a regulator?

What are the characteristics of the City’s current FF&E purchasing program, from a purely descriptive perspective and then viewed through the lens of the environment, economy and equity paradigm?

What do other large owners, both public and private do with respect to FF&E? What are the national and industry standards? What steps have they taken towards improving those purchases from an environmental sustainability perspective? What have been the results? What are the currently accepted best practices for FF&E purchasing and post-purchase use?

What obstacles to adopting identified best practices exist at the City, as a whole, and at a design and construction agency, such as DDC? What benefits to adopting identified best practices would accrue to the City and at what costs?

How might the City apply external and internal environmental sustainability principles holistically to the City’s FF&E purchasing program, looking at how FF&E purchases move through life, first in use by City employees and members of the public (including a focus on toxic content and impacts on energy use) and then through the materials-to-waste cycle (including a focus on reuse and recycling)? How might the City rethink its surplus property process with environmental sustainability principles, such as beneficial re-use of FF&E, in mind?

What economic development policy issues would be raised by sustainable FF&E initiatives? How does the FF&E marketplace identify environmentally sustainable options for purchasing? How would sustainable FF&E initiatives affect the market for “green jobs”?

What would a feasible strategy to apply environmental sustainability practices to FF&E look like for the City, as a whole, for individual construction agencies, such as DDC, and for other agencies involved in the FF&E lifecycle?

What design interventions, including active design interventions, are possible in connection with such a holistic approach to FF&E?

CLIENT AGENCY/AGENCIES:

DDC, DCAS, OLTPS



How to Develop an Evaluation Tool for Sustainable Design and Construction Initiatives?

BACKGROUND:

Over the last ten years, the City has set in motion a number of initiatives that have the potential to dramatically reduce the physical city's environmental impact on the local, regional, and global scale. Many of these initiatives also have social and economic dimensions. Collectively, these efforts are typically referred to as "sustainable" initiatives, and have chiefly taken three forms: pilot projects, policy statements/plans and related legislative changes.

On the pilot project front, DDC's Office of Sustainable Design stewarded green building pilot projects and published several sustainability-related design guideline handbooks and reports, all of which formed the basis for Local Law 86/2005, the City's first "green building" law. Around that time, several other local "green" laws were passed, including laws addressing environmentally preferable purchasing in 2005 and addressing emissions from off-road construction vehicles in 2003. Since then, other agencies have begun making changes to standard practice that do not require legislation. For example, DOT developed, with many other agencies, its new street design manual, paving the way for changes to standard roadway reconstruction specifications allowing for sustainable practices.

The City's PlaNYC policy initiative, produced by OLTPS, powers the concept of a pilot approach with related legislative packages. While "green" legislation had been enacted before the release of PlaNYC, following its release, coordinated sets of legislation have now been adopted. The first set of bills, the Greater Greener Buildings Plan, was enacted in 2009, followed by a package of legislation related to water efficiency. Several initiatives related to open space requirements and goals were also included in PlaNYC, and a citywide effort to "green" infrastructure has gone into implementation. The City has also leveraged nonprofit organizations in order to meet the goals outlined in PlaNYC.

When these initiatives have matured in operation, it will become possible to evaluate their impact in order to inform future initiatives and tweak existing ones.

QUESTION(S):

What would a literature survey about evaluation tools for environmental sustainability initiatives suggest for the City? What evaluation tools outside the environmental sustainability area could be modified for use in evaluating environmental sustainability activities?

What are best practices in environmental sustainability activity evaluation across the country that would be suitable for large dense urban area such as the City? Do any of these best practices reflect the economic, environmental and equity paradigm? What data is required to be collected for such analyses? What monitoring systems need to be in place?

What different approaches would be necessary to evaluate the impact on the municipal portfolio and on the private sector?

Based on the above work, how might the City design an evaluation model/conceptual cost/benefit model for its various environmental sustainability programs?

Given that the economy of New York City is the biggest regional economy in the United States and the second largest city economy in the world, how could the City evaluate the extent to which these initiatives affected related markets?

Now that several of DDC's pilot projects been operational/occupied for many years, how would DDC evaluate how these completed pilot projects are performing from an environmental resource perspective?

CLIENT AGENCY/AGENCIES:

DDC, OLTPS



How to Evaluate the Co-Benefits Provided by Cross-Systems “Green” Infrastructure Projects?

How can the City estimate the technical cross-systems benefits, such as reducing energy used to cool and heat our buildings, reducing local air pollution, mitigating the impacts of greenhouse gas emissions, enhancing community livability and creating new biohabitats?

Of those benefits, how can the City estimate the costs/savings to the City budget that would be realized by other agencies?

CLIENT AGENCY/AGENCIES:

DEP, DDC, OLTPS, DOT

BACKGROUND:

New York City’s Green Infrastructure Plan to reduce combined sewer overflows by more than 12 billion gallons per year by 2030, or 40% from current levels, will employ various types of “green” infrastructure to achieve this goal. “Green” infrastructure such as Greenstreets projects, which are designed to manage storm water, blue roof detention systems, and green roofs, can be more cost-effective than standard wastewater treatment techniques and the benefit of these systems can be realized almost immediately.

The various green infrastructure systems manage storm water in different ways so that in certain circumstances some would perform better than others. For example, some existing buildings might be more suitable for blue roof systems than green roof systems based on the structural capacity of the existing building. By having a portfolio of techniques, the City will be able to address storm water management issues through a variety of responses. In order to assess the appropriateness of one green infrastructure technique over another, DEP takes into account many factors such as soil composition, depth to water table, configuration of existing structures, total cost, cost per gallon of storm water captured, location of the potential installation, and other baseline factors. This analysis helps DEP determine whether a particular green infrastructure technique is suitable and cost-effective for managing storm water in a particular location.

QUESTIONS:

How could the City expand the green infrastructure analysis described above in order to estimate and capture valuable co-benefits provided by green infrastructure across to other related systems?

How do other municipalities handle cross-systems approaches to green infrastructure? What are considered to be best practices?

\$ What Has Been the Impact of the City's Fiscal Crisis on Capital Program Practices and Policies?

insufficient capacity to manage multiple prime contracts, which is required by state law. Further complicating matters, the state of building technology changed during the control period years, increasing the complexity of project management.

QUESTION(S):

What would an investigation of the impacts of the fiscal crisis and its workout on the policies and practices of all participants in the City's capital program from the time of the crisis to present time reveal to the City?

BACKGROUND:

The City's fiscal crisis—the build up to the crisis, the crisis itself and the legislated workout—is a well-studied and well-analyzed historical event. Typically, however, the analysis in prior work has been a high-level one. It is not immediately clear that any research has focused on the “inside baseball” impacts of the fiscal crisis, the impacts on the City government's institutional participants and day-to-day management practices. The capital program involves a good cross section of governmental processes against which to analyze the continuing impacts of events that took place as long as 36 years ago, with the actual fiscal meltdown and legislative solutions, and as long as 25 years ago, when the City emerged from a strict level of control by a State-controlled entity.

For example, when the crisis hit and virtually all construction came to a halt, the City's standard construction contract did not contain a provision to terminate the contract at the City's convenience. The absence of such a provision created a stream of construction claims that ended up at the Comptroller's Office for settlement. The Law Department, during the Koch Administration, created the Commercial Litigation Division, the job of which was to vigorously defend all existing provisions in the contract to staunch the flow of funds and monitor the contract to make sure that all appropriate risk shifting provisions were in the contract and revised as necessary.

During the period between the creation of the legislative workout and the end of the control period, there was a close connection between the legal and budget objectives, policies and practices. During this time, the City's hallmark legislative initiative in construction—the campaign to repeal the Wick's Law—reflects the Program to Eliminate the Gap mechanism, a quintessential feature of the budget practice imposed by the Fiscal Emergency Act. The campaign also reflects the reality the City found itself in as it emerged from a control period in 1986—having had to let most of the City's technical staff, especially engineers, go when there was no money to pay for projects, the City emerged from the control period with

CLIENT AGENCY/AGENCIES:

DDC

MANAGEMENT WITH AN URBAN PLANNING TWIST

In the questions that follow under this sub-heading, Management with Urban Planning Twist, some management issues are made more powerful when the owner is a governmental entity with formal municipal planning powers. The use of this sub-heading is an attempt to conform to the identified core disciplines of the Built Environment, described above, for research questions with an urban planning twist.



How Can Urban Planning Strategies Help Manage the Inevitable Mismatch between Static Capital Assets and Demographic Trends?

BACKGROUND:

Across the spectrum of public uses, there is always the potential for a mismatch over time between long-lived fixed capital assets and the demographic changes in populations that they were intended to serve as well as general changes in demand for such services. Demographic forecasting techniques are of limited predictive value. Public owners may find it difficult to change policies or practices quickly, especially in view of the practice of over-building public assets to assure they last “forever” in the face of historically insufficient maintenance after construction completion. This mismatch is further complicated in a highly built urban environment with little available land as a general matter and even less for public projects. Under such circumstances, currently underutilized public assets of many kinds might be considered as resources for future planned and/or unanticipated demand.

This topic has been the subject of two Town+Gown projects: one recommended developing plans for multiple compatible uses within underutilized structures, the other explored how two agencies might co-locate services within an under-utilized structures. The idea that public structures, such as school buildings, can be shared productively by multiple human services agencies and groups providing social, educational, cultural and health services has been discussed since the early twentieth century. Difficulties in coordinating such efforts and allocating expenses and savings among separate agencies providing services have impeded implementation. Yet, the sustainability agenda has emphasized adaptive reuse of existing buildings, and trends in work standards have evolved to include job sharing, telecommuting and flexible co-location of staffs from various offices across an organization.

QUESTION(S):

Building upon prior work, how might the City implement the recommendation to develop plans for multiple compatible uses within underutilized structures of all types in

order to optimize utilization of the City’s existing capital assets?

How might the City improve on the long-term accuracy of demographic forecasting models underpinning the capital planning for all City agencies? What precautionary strategies could the City use to mitigate the inadequacies of demographic forecasting instead of playing catch-up when the mismatch between assets and demographics becomes obvious? Further, what planning techniques are available to the City to actively influence demographics instead of reacting to them?

To what extent would requirements imposed by various regulations, including those governing agency operations and finance, impede any co-location initiatives?

CLIENT AGENCY/AGENCIES:

DDC, OMB, DCAS

COMPLETED PROJECTS:

Jennifer Chung, Jorge Ubaldo Colin Pescina, Tanya Fonseca, Heidi Gen Kuong, Christina Ghan, Kye-Joon Lee, Francis Tan and Nathan Tinclair, *Planning for the Optimum Utilization of New York City Schools* (Columbia/SIPA: 2010) and Pablo Arboleda, Christine Flynn, Jose R. Mejia, Taryn Yaeger and Ashley Wessier, *Setting the Stage for the Co-location of Senior Centers in Public Schools* (New School/Milano: 2011)



What Is the Impact of Less-Than-Perfect Levels of State-of-Good-Repair Investments—or Is Almost “Just-in-Time” Repair Good Enough for Infrastructure Systems?

less-than-perfect levels of investment in state-of-good-repair activities?

CLIENT AGENCY/AGENCIES:

DDC, OMB

BACKGROUND:

The City experiences impediments in planning for, and achieving, state of good repair investments. At the same time, the mismatch between long-lived capital assets and changes in the demand for the related services that inspired the project in the first place might argue against rigid application of planning, budgeting and execution rules that do not reflect such dynamics. Continuing evolving technology may also argue against rigid application of such rules, since replacing near or at the time of actual failure permits the replacement to take advantage of the latest technology. Further, there have been recent advances in applicable quantitative techniques such as hedonic place-in-place regression techniques for types of capital investment as well as engineering analytical techniques based on the epidemiological statistical modeling.

QUESTION(S):

What would a literature survey of capital asset condition assessment theory and practice and a complementary literature survey on recent innovative technology in asset evaluation techniques suggest to public owners such as the City?

How does the federal government, as well as states and other local governments across the country, evaluate asset condition and what systems do they follow to plan for, budget and execute such state-of-good-repair work? What are best practices?

Based on the literature review and survey of best practices, what elements should be in a public owner’s state-of-good-repair standard that applies to and/or governs capital project planning, budgeting and execution?

What available technologies are best suited for asset condition assessment?

Based on the literature survey, how might the City design a quantitative methodology to evaluate the impact of

How Do Other Cities Do It—Design Oversight of Public Realm?

BACKGROUND:

Established in 1898 as the Art Commission, New York City's design review agency was renamed the Design Commission in July 2008, to better reflect its mission. The Design Commission reviews permanent works of art, architecture and landscape architecture proposed on or over City-owned property. Projects include construction, renovation or restoration of buildings, such as museums and libraries; creation or rehabilitation of parks and playgrounds; installation of lighting and other streetscape elements; and design, installation and conservation of artwork. As the City's mature built urban environment moves forward into this 21st century, issues related to the aesthetics of the public realm are bound to come up, making this an optimum time to begin some threshold analyses.

QUESTION(S):

What are the aesthetic issues for mature built urban environments?

What are the various interests involved in and affected by aesthetics of the public realm?

What do governments coterminous with other mature urban environments do to raise and manage aesthetic issues?

How might the City shape and oversee these issues?

Based upon a model of the costs and benefits of the current scheme, what would the costs and benefits of possible alternative models be?

CLIENT AGENCY/AGENCIES:

DC, DDC



How Do Other Cities Do It—Systematic Planning for Services and Related Capital Assets?

What types of integrated planning practices do other cities use to optimize their use of capital facilities?

What are best practices?

Based upon a model of the costs and benefits of the current methodology, what would the costs and benefits of possible alternative models be?

CLIENT AGENCY/AGENCIES:

OMB, DDC, DCAS

BACKGROUND:

The planning of public facilities and infrastructure related to service delivery is often done by agencies in isolation from each other, making it difficult for system-wide planning to make optimal use of capital facilities. Theories on program performance and/or fiscal benefits from service delivery centralization or decentralization vary over time and with facts. But integrated systematic planning that focuses on both the service and the facility where it is delivered across the entire enterprise could yield improvements in service performance, optimization of related facilities and avoided costs.

Structures and infrastructure are no longer static items with fixed life spans. For large institutional systems, such as hospital systems and universities, the rapid change in technology has forced them to view their capital inventory more flexibly as combinations of systems with respective different useful lives that can be manipulated to meet anticipated and unanticipated needs. In addition, the current environmental sustainability agenda has increased interest in designing for sustainability over time as well as in adaptive reuse of existing assets. Further, recent trends in work standards, such as job sharing, telecommuting and flexible co-location of staffs from various offices across an organization also create tools for institutions to consider when dealing with future system needs.

QUESTION(S):

What would a literature survey suggest to public owners such as the City about the possibilities of integrated systematic capital planning?

What program performance and capital planning issues are raised by the concept of integrated systematic planning?

What are the various interests involved in and affected by such a methodology?



How to Expand the Use of Cross-System Environmental Protection Methodologies?

BACKGROUND:

A pressing long-term issue facing the City's built environment is how to address climate change issues in a cost effective manner. As the natural environment consists of various inter-related systems, the City's built environment mirrors such inter-related systems, so that cross-system efficiencies may be possible. The most recent example of cross-systems thinking has been on storm-water issues. A related issue is determining the scale at which, or a combination of scales at which, a particular problem can most effectively and efficiently be addressed.

QUESTION(S):

Using the storm-water issue as the take off point, how should the City analyze other cross-system environmental protection options for future implementation?

CLIENT AGENCY/AGENCIES:

DDC



How to Promote More Sustainable Neighborhoods—Economically, Socially and Environmentally?

COMPLETED PROJECTS:

Ian Henri, *Utilizing the Pro Forma Investment Model in a Sensitivity Analysis to Move Toward a Full Cost Accounting of Proposed Built Environment Regulation* (Brooklyn Law School/Corporate and Real Estate Clinic: 2011) and Judy Change, Lindsey Langenburg, Caroline Massa, Jake Schabas, Dian Switaj and Joyce Tam, *Planning for the Future of the Park Avenue Corridor* (Columbia/GSAPP: 2011)

BACKGROUND:

The sustainability agenda has exposed the interdependence of all aspects of life, from the economy to the environment to human life, from the level of the social network to the level of individual health. Environmental sustainability requires accounting for the economy's negative externalities upon the environment, but once these negative externalities are identified, it becomes difficult to ignore related social externalities. The full cost accounting methodology, focusing on economic, environmental and equity issues (the 3 Es), provides a means to identify and assess the inter-related economic, social/health and environmental externalities from a proposed activity or action. Planning for development in an urban environment is a governmental action that results in economic activity that impacts both the social network—or neighborhood—and the environment.

QUESTION(S):

How might the urban planning function take advantage of the full accounting methodology to study the impacts of a proposed action on the neighborhood, and the wider jurisdiction, taking into account the economy, the social network and the environment?

How might the urban planning function use full accounting in an evaluation tool to measure the effects of a planning action within a neighborhood and within the jurisdiction as a whole?

How might the City use the sustainable neighborhood concept to plan for more efficient and effective social services provision?

CLIENT AGENCY/AGENCIES:

DCP, DDC



How to Repurpose Publicly-Owned Sites over Time: A Multi-disciplinary Investigation

how to rethink prior attempts at sale. The components of the options should be evaluated for feasibility.

CLIENT AGENCY/AGENCIES:

DCAS, DDC, LPC

BACKGROUND:

The City owns and manages a spectrum of properties across the City. The reasons for properties coming into City ownership and the uses to which such properties are put are almost as varied as the physical characteristics of the properties themselves. Further, these properties, with certain exceptions, are subject to a matrix of regulations. The Charter limits the methods by which the City may dispose of its property it deems no longer necessary. Whether to sell at public auction or to use as an economic development vehicle in a negotiated sale, the combination of prior use, land use restrictions and context and the local political context may conspire to make the disposal challenging, requiring a high level of creativity, drawing upon many disciplines, to repurpose the site.

As one example, the City has attempted several times to dispose of property it owns on Staten Island that was the site of the City's farm colony, the first welfare-to-work program for poor single men at the turn of the last century. In prior attempts to sell, the landmarked buildings on the site that are in various states of disrepair posed a problem for potential buyers. Further, the surrounding neighborhood has a variety of uses, but Staten Island has several land use/planning issues at the moment, including public opposition to randomly-placed residential projects (there is a growth management task force focusing on that issue). This property seems caught in a net of various regulations and programs as well as land use trends, and related backlash, on the Island, which has developed differently than the rest of the City.

QUESTION(S):

Focusing on the Farm Colony as a case-study and the issues raised by the history and regulated use of the site, the land use and political context of the site and the economics of real estate development in the City, what options might increase the number of potential buyers and/or the sale price to the City? The options should include new thoughts about how to repurpose the site as well as



Urban Planning Investigations into Active Design

BACKGROUND:

Historically, built environment design has achieved positive public health outcomes, from the public water and parks systems, the public sanitation program to housing and zoning laws. In the latter part of the 20th century, built environment design initiatives have ranged from developing pollution control features on factories (and cars) to eliminating toxic compounds from building materials such as asbestos and lead. At a time when the cumulative effect of contemporary planning and design have reduced the need for daily physical activity, public health researchers are now exploiting the relationship between built environment design and public health outcomes in the quest to reduce the incidence of obesity and its related chronic diseases. Physical activity has been found to prevent a host of chronic conditions. To illustrate, parks once provided respite from the week's strenuous labors, and now they must be designed to provide situations for physical recreation, because jobs are sedentary and people commute from home to jobs in a variety of powered vehicles. Contemporary building design—both commercial and residential—has reduced the number of opportunities for people to make up the slack in their physical activity. Active design principles in building design and in planning can increase the opportunities for daily physical activity that can help reduce the incidence of chronic disease.

QUESTION(S):

How would one design a cost-benefit model to test the impact of the City's Active Design Guidelines applied to various building typologies on building users' health status? What data exists to apply to the cost-benefit model described above? What data would need to be included in a survey to round out the necessary data?

Using the Astor Place plaza as a potential case study, how would one design a model to measure the change in pedestrian use of street plazas pre- and post-construction?

How would one design a survey instrument to use for all constructed plazas in the program going forward?

Physical activity has been shown to increase balance and cognitive functioning in elderly and tutoring in after-school programs has both physical and mental health benefits for seniors. Where are the senior centers and public schools with after-school programs that are within 1/4 mile from each other in the five boroughs? Are those streets sufficiently pedestrian-friendly to encourage seniors to volunteer in schools?

CLIENT AGENCY/AGENCIES:

DHMH, DDC



Studies in Healthcare: How Can Urban Planning Strategies Help Manage the Inevitable Mismatch between Static Capital Assets and Technology Trends?

BACKGROUND:

In addition to the potential for a mismatch over time between long-lived fixed capital assets and the demographic changes in populations and service demand, innovative technology also exacerbates the potential for a mismatch. Nowhere is this more evident than in the healthcare industry, where the programmatic changes made possible by electronic technologies, which have been embedded in law by the recent federal affordable care law and American recovery and reinvestment acts, will have an impact on the physical infrastructure where healthcare is delivered. Advances in health information technology, notably the appearance and later mandated use of the electronic health record, has the potential for transforming not only the way healthcare is delivered but also the physical settings where it is developed. Both government and the healthcare industry view the use of technology as central to changing the focus of payment methodology, shifting the focus from paying for procedures and the hard assets in which and by which they were delivered to paying for healthcare outcomes including maintaining community health. The image of the monolithic art deco hospital structure in 1950s movies, that gave way to the medical center model initiated in the 1980s, stands a very good chance of being rendered completely irrelevant as technology, in particular, health information exchange systems, transforms the way we think of healthcare and health, by making the practice of medicine possible across a continuum of care settings that will further change as health information exchange systems evolve over time, also informed by analyses of healthcare data collected by such exchanges.

QUESTION(S):

How is the development of health information technology/exchange (HIT/E), in conjunction with other related healthcare trends such as federal financing initiatives, likely to impact the current inventory of healthcare physical assets? What other uses can be made of redundant or unnecessary physical assets?

How will HIT/E affect provision of healthcare viewed from a physical asset context? from a financing/reimbursement context? from a demographic context, including the aging of the population, the predicted physician shortage, trends in illnesses?

What does the future of healthcare delivery, facilitated by HIT/E, look like “on the ground”? How can the future of health care delivery from a physical perspective be planned?

CLIENT AGENCY/AGENCIES:

DDC



Planning Investigations into Obduracy

BACKGROUND:

The urban built environment is composed of long-lived physical assets. There is a considerable amount of literature focusing on the “infrastructure crisis” and the nation’s persistent inadequate funding of maintenance of existing infrastructure. There is also the practice of using expansion projects as tools of economic and urban development. And yet built artifacts have a tendency to become obdurate, to remain behind, with adverse impacts, when the conditions and theories that supported their creation have been eliminated or discredited.

These built objects can also form parts of systems—transportation systems, various utility systems, urban systems—that become the subject and tools of various thinking about their nature in the larger civic project—now we are concerned with environmental sustainability and economic development, 20 years ago our planning efforts had different ends and means, and 20 years before that, other ends and means. While an urban space is a work in progress, our thinking about our urban space continually changes. Yet the products of all those theories and efforts remain in our physical space, creating obstacles for current and future theories and plans.

It is possible to study the evolution of infrastructure technology and planning theory from the various disciplinary perspectives to shed light on why objects remain in place when the animating needs and rationale disappear and are no longer valid. Is it also possible that quantitative analyses, looking at all manner of “on the ground” data, from construction to finance, can help shed light on this phenomenon?

QUESTIONS:

Different construction projects take dissimilar times to accomplish. The actual construction process is only one factor in the build-out period, with regulatory issues, financing, community engagement, bureaucratic consultation, and even weather also playing a role. Increasingly

obvious is that the built environment itself also is a factor, whether it be the difficulty of rearranging underground infrastructure or the resistance of buildings to “easy” demolition. To what extent could a typology of difficulty be developed to aid in the scheduling of construction projects?

To what extent can one predict obsolescence of various areas of the City based on the type of construction, the use, and the time during which the area was developed?

Does where a building is located in the City—not just geographical space, but a space of growth/decline, investment/reinvestment/disinvestment—affect whether or not it is considered obsolete?

CLIENT AGENCY/AGENCIES:

DDC

ECONOMICS

For the questions under Economics, the City acts in the role of either economic policy maker or regulator. The City builds through its capital program, a significant portion of New York City's public realm. The public works or capital programs of all levels of government are, in essence, work orders for facilities relating to "social" or "public" goods and to "mixed goods" that correct for negative and positive externalities, and while engaging in such activities, the City acts in its role of economic policy maker. In its role of regulator, the City directs and regulates private capital participation in the public realm (e.g., utilities—telecommunication, electricity, gas) and regulates the safety of the construction process and the products of construction of both public and private owners. Moreover, the practices of large public owners within a regional construction market have impacts on such market. The City also acts in the role of financier when it funds, by the issuance of its own debt, the construction of such social goods, or when it provides subsidies in numerous forms to other entities to enable them to construct such social goods by reducing the overall cost. For more detailed background information related to Economics issues, please see *Orientation to Policy in the Built Environment*.

\$ Future Workforce Needs and Development—What Are the Conditions for Construction Business Formation and Success?

BACKGROUND:

The fragmented construction industry contains many sub-markets within a local area and a wide spectrum of organizational forms. To some degree, the size and complexity of prevalent construction project types can define the nature of the local market. The local market for Manhattan, dominated by high-rise offices and housing structures, is quite different from the local market for Brooklyn, dominated by low-rise multi-family housing. Further, the industry is also a haven for small businesses. Despite some consolidation in the industry, after the several top national firms, the size and revenues of the remaining construction companies drop off sharply.

One assumption behind the public construction solicitation methodology is that an open competitive process will assure a competitive market in an economic sense. Unexamined public construction laws, however, may create regulatory complexities that operate as inadvertent barriers to effective competition. Standard public construction contracts reflecting the statutory scheme may not permit variation in approaches to reflect different local construction markets, and may also operate as inadvertent barriers.

Research and analysis are necessary to understand the local construction marketplace(s) better in order to develop appropriate strategies to fill market gaps, to help support business capacity development, especially for small businesses, and to increase/preserve competition by reducing unnecessary barriers.

QUESTION(S):

What would a literature survey on the origins and life cycle of construction contractors and subcontractors, the sources and training of entrepreneurs, the internal and external barriers they face, and the components of success suggest for public owners like the City?

What would case studies of several small construction businesses across the City suggest for the City?

What do other agencies and local governments in the State and across the country do to increase small construction business capacity? What are best practices?

What would analysis of defaulted contractors and contractors in trouble during construction reveal about small business capacity issues and issues businesses face as they try to move from one level to the next?

After the qualitative work above, designing and conducting a survey for small businesses in a particular market may become feasible.

CLIENT AGENCY/AGENCIES:

SBS, DDC, MOCS



How Do Service Delivery Methodologies Increase Alignment between Principal and Agent?

BACKGROUND:

Modern methodologies permitting public owners to match project needs with the services of construction professionals include design-build, design-build-operate-maintain, and design-build-finance-operate-maintain, and require “best value” selection criteria currently not permitted to many public owners. New York State law prohibits public owners from using the modern successors to the traditional design-bid-build methodology that private owners have used for many years.

The various service delivery models allocate and manage risk among the owner, the architect and the contractor in different ways. The appropriateness of a particular service delivery model depends on the complexity of the project and the internal capacities of the parties. There is no one perfect service delivery model—the benefits and disadvantages of the models vary with the particulars of the project and the parties.

QUESTION(S):

What would a literature search on the relation between service delivery methodology and project schedule, budget, safety and quality suggest for public owners?

To the extent a literature review uncovers quantitative analyses of actual construction projects, how might the City design a quantitative analysis to evaluate the City’s design-bid-build projects against other public owner projects using other methodologies?

For those jurisdictions, unlike New York, that allow public owners to use modern service delivery methodologies such as design-build-operate-maintain, what are the quantitative and qualitative differences between publicly owned and operated construction projects and publicly owned but privately operated construction projects?

CLIENT AGENCY/AGENCIES:

DDC, MOCS

COMPLETED PROJECTS:

Mathew Dudley, *The Effects of Preemption and Dillon’s Rule on Municipal Home Rule in NY: Limiting Public Construction Contracts to the Design-Bid-Build Service Delivery Methodology and Public Works Service Delivery Methods* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2010); Cecily Goodrich, *Statutes for Public Construction* (chart) (Brooklyn Law School/Clinical Program: 2010); Steven Spada, *What Are Statutory Consequences of Being a “Public Works”?* (chart) (Brooklyn Law School: Corporate and Real Estate Clinic: 2010)



What Are the Impacts of Road Infrastructure Reconstruction?

BACKGROUND:

The City's diverse capital program rehabilitates, maintains, and expands the public infrastructure of a large and complex built urban center. Routine street reconstruction combining planned water and sewer reconstruction with planned upgrades of City streets, performed by DDC in conjunction with DOT and DEP, is an essential part of keeping the City's infrastructure in a state of good repair and likely has an impact on the economic vitality of business districts and property values of residential districts. The federal economic stimulus bill underscores the important relation of capital infrastructure projects to the economy. It is possible to evaluate various dimensions of the costs and benefits (internal and, to the extent possible, external as well) of capital street reconstructions over time, against a set of control data such as crash data, retail sales, property values or sales prices (as described in greater detail below), crime, environmental impacts and perception of residents/business owners/shoppers.

QUESTION(S):

What would a literature survey of the impacts of roadway construction on various indicators suggest to public owners such as the City?

What would be the appropriate strategies to pursue/ methodologies to use in analyzing the impacts of roadway reconstruction on the surrounding neighborhood?

Based on the results of the literature survey and using statistical techniques, including hedonic place-in-place regression, for other types of capital investment, what are the impacts of the City's roadway reconstruction projects on the surrounding neighborhoods?

CLIENT AGENCY/AGENCIES:

DDC, DOT



What Economic Factors Influence Costs and Project Efficiency on Roadway Projects?

BACKGROUND:

Owners, especially public owners, use in-house personnel and contracted consultants on projects in different ways and proportions in order to manage the schedule during the year. While consultants are initially more expensive than in-house personnel, agencies can remove consultants from projects as necessary, increasing overall program management flexibility.

The Comptroller's Office under two different Comptrollers (Goldin and Hevesi) conducted analyses of roadway resurfacing, comparing in-house and contracted cost performance. More recently, the American Council of Engineering Consultants commissioned a study comparing in-house and contracted cost performance on State roadwork. These studies come to surprisingly different conclusions, raising the possibility that broader economic conditions may be influencing the cost analysis.

QUESTION(S):

What are the various economic conditions that have a significant effect on the cost performance of in-house staff and consultants on roadway projects?

CLIENT AGENCY/AGENCIES:

DDC

Why Does It Cost So Much to Build in New York—Private Projects?

BACKGROUND:

Year after year, in rising or falling markets, whatever the building type, construction costs in New York City top the listing of costs among major American cities. Unexamined state and local government laws and regulations may create regulatory complexities that operate as inadvertent barriers to effective competition in an already fragmented construction market. Risk shifting provisions in the private construction statutory schemes that do not permit changes in approaches to reflect different project types and project needs, much less the different local construction markets, may also operate as inadvertent barriers.

QUESTION(S):

What would a literature survey on the drivers of construction costs, with a focus on private construction, reveal to government as regulator?

To the extent drivers of increased costs are within the regulator's control, what changes to regulations would minimize cost increases or reduce costs over time? What countervailing public policy concerns would be affected by proposed cost reforms?

CLIENT AGENCY/AGENCIES:

DDC



What Are the Economic Consequences of Being a “Public Works”?

BACKGROUND:

In New York, the application of various public construction processes turns on whether a project is a “public works”, which is defined by case law and not by statute. For local governments, the case law is derived not from one statute, but rather from two—the Labor Law and the General Municipal Law—and the case law is not necessarily identical. For the state government and applicable agencies, the two laws consist of the Labor Law and the State Finance Law.

QUESTION(S):

What are the economic consequences that flow from being deemed a “public works”?

What are the different economic consequences that flow from the mandated public construction process and the private construction processes?

CLIENT AGENCY/AGENCIES:

DDC

COMPLETED PROJECTS:

Mathew Dudley, *The Effects of Preemption and Dillon’s Rule on Municipal Home Rule in NY: Limiting Public Construction Contracts to the Design-Bid-Build Service Delivery Methodology and Public Works Service Delivery Methods* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2010); Cecily Goodrich, *Statutes for Public Construction* (chart) (Brooklyn Law School/Clinical Program: 2010); Steven Spada, *What Are Statutory Consequences of Being a “Public Works”?* (chart) (Brooklyn Law School: Corporate and Real Estate Clinic: 2010)



How to Increase Construction Research and Development?

CLIENT AGENCY/AGENCIES:

DDC

BACKGROUND:

The City has a dual role with respect to Built Environment research and development. As an owner, the City has an interest in the application of innovative technology on its projects, and, as an economic policy maker, the City has access to strategies to increase research and development generally within the local construction market. But the construction industry has historically been a conservative one, often referred to as “the industry that time forgot”, partly as a result of the nature of construction projects, fragmentation of the construction industry and atypical pricing mechanics.

But despite insufficient levels of government-sponsored innovation, there have been successes in the past, at all levels of government, in sponsoring and using research and development for innovative technology. And, the Obama Administration has recently taken an active interest, at the federal level, in creating programs to increase levels of public and private innovation to enable the U.S. to remain competitive in the global economy.

QUESTION(S):

What would a literature survey of public sponsorship of innovation suggest for public owners such as the City?

What innovative construction practices/techniques developed over the last 30 years have resulted in cost reduction/containment, safety improvements and/or quality enhancements? Of these, which innovations had implications for urban policy, research strategies and business/professional practices? What were the respective roles of government, business and academia in developing/implementing the innovations?

Based on examples of successful public sponsorship of research and development in general and/or use of innovative technology in construction, what strategies could the City use to increase the application of innovative technology in its capital program?

\$ How to Expand Analysis of Asset Appreciation Attributable to Historic District Status?

BACKGROUND:

Anecdotal observations suggest that landmark activities, which contribute to the creation and maintenance a unique sense of place, neighborhood and density, also likely contribute to the appreciation of property values. While certain prospective property owners may purposely avoid purchasing property within a historic district, there often exists an abundance of potential purchasers who willingly pay a premium for properties that boast historic architectural features, and to which a rich historic narrative can be affixed. Moreover, for these property owners, the landmark regulator's oversight and regulatory monitoring provide a measure of certainty that the intrinsic character of the immediate neighborhood will remain intact, further preserving the values of individual properties.

To date, only one analysis, conducted by the City's Independent Budget Office, has attempted to evaluate the impacts of landmark status on a neighborhood. This analysis was limited by the nature of the question asked—whether there was any evidence that historic districting in New York City had constrained the appreciation in residential property values—the focus on six community districts in Brooklyn and the particular statistical techniques used. The conclusions were consistent with anecdotal observations. The prices of houses in historic districts were higher than those of similar houses outside historic districts and overall price appreciation from period studied was greater for houses inside historical districts than outside.

Preserving the City's history by preserving its buildings is a value embedded into the creation of the LPC. As the LPC enters its fifth decade, expanding upon the initial analysis to measure more widely the impact of landmark activities would be useful to inform future conversations about landmark activities.

QUESTION(S):

To what extent and in what manner is it possible to ex-

pand upon the initial analysis and conduct studies adding other types of properties and/or other areas and using other statistical techniques such as paired-sale appreciation analysis?

CLIENT AGENCY/AGENCIES:

LPC

COMPLETED PROJECTS:

Daniella Bonilla, Mireille Martineau, Chris Minniti and Maria Pedroza, *Landmark Designation: How Do Other Cities Do It?* (NYU/Wagner: 2010); Jennifer Efron, *Landmark Designation: How Do Other Cities Do It?* (Brooklyn Law School/Corporate and Real Estate Clinic: 2009)



How to Estimate LEED Payback for New Construction?

BACKGROUND:

One research question from the 2009-2010 Research Agenda generated a project with MOEC to explore whether the City could analyze the long-term savings associated with green building practice if the investment decision methodology took into account a longer-term horizon than current practice. The project, entitled “Long Term Capital Investment and Green Construction in New York City”, conducted extensive research into existing cost/savings analyses focusing on long-term sustainability and then applied them to Local Law 86, the City’s effort to bring all government buildings in line with LEED standards, generating an estimate of aggregate savings from productivity, health and waste reduction. Building on the foundation of this research, the next step is to develop a model to estimate the payback to the City for each of the points in LEED 2009 for new construction.

QUESTION(S):

How could the City develop a cost/savings estimate model for new construction complying with LEED 2009 standards?

How could the City test such model on a case-study project?

What available technologies are best suited for quantifying such payback?

CLIENT AGENCY/AGENCIES:

MOEC, DDC

COMPLETED PROJECT:

Xiao Yi Chen, Serdar Oztopal and Roberto Pesquera, *Long-Term Capital Investment and Green Construction in New York City* (Columbia/SIPA: 2010)

\$ How Can the City Create Its Own Model of the Local Construction Market?

BACKGROUND:

Attempts at predicting economic behavior in construction is a dicey affair in general and nowhere is it dicier than in New York City. Year after year, in every report of construction costs in major American cities, New York City tops them all. Yet, commercial report services for components of construction costs, which are disaggregated by region and are used by a diverse group, including economists and estimators on jobs to be bid, always make a disclaimer for the New York City region. Since the commercial regional reports are estimates themselves from aggregated data, they are not terribly reliable within the City market. They are top down, not bottom up, estimates. The national economic accounts, although recently updated to reflect changes in various industries, still do not account for the construction industry as one would want. It is aggregated in ways that are inappropriate for the fragmented industry that is construction. Further, since the demand for construction is a derived demand from the overall business cycle, upturns and downturns in construction lag behind overall economic trends, and construction industry cycles may be more volatile than the general business cycle.

The idiosyncratic nature of the New York City market argues for New York City-centric accounting of economic behavior. That would be a tall order, requiring the application of resources heretofore not devoted to one metropolitan area, notwithstanding its importance to the national economy, and is likely never to happen. One practical need for such an individual approach, however, would be the need for a public owner, such as New York City, whose capital program and practices affect the local construction market and its prices, to be able to predict changes in the construction market so that it can plan and budget more effectively. The City, as a public owner, has years of its own cost data that could be analyzed to determine the relation of project costs to variables, possibly enabling the City to construct a model of the city's construction economy to predict changes in construction activity and cost, much in the way it has constructed a model of the city economy to estimate

future revenues for the budget. Further, such an analysis could identify components of construction that function as market indicators within the New York City area so that we might create a market basket of cost indicators to follow going forward to help our capital planning and budgeting efforts.

QUESTION(S):

How might the City, as a foundational research matter, approach the feasibility of creating its own model of the local construction market and a market basket for costs for the purposes of more effective capital planning and budgeting?

CLIENT AGENCY/AGENCIES:

DDC

How to Measure the Effects of Various “Green” Initiatives—Cost/Benefit Analysis of Building Sustainability Implementation?

BACKGROUND:

The implementation of sustainability measures in residential and office buildings is becoming more ubiquitous whether because of requirements to be phased in by law or a desire by building owners and developers to improve the operating efficiency of their buildings. The main reasons that are often given for the benefits of sustainability implementation can be compartmentalized into three fundamental categories:

- 1) Energy Efficiency: sustainability measures will decrease the operating cost of a building while simultaneously increasing the lifespan of operating systems and allow buildings to operate more efficiently than similar sized conventional buildings;
- 2) Building Value: whether residential or commercial, recent history has shown that developers/building management can charge more per square foot for buildings that are LEED or have certain sustainability measures implemented; in addition the tenant/resident perception is that because the building is ‘green’ it is elite;
- 3) Environmentally Friendly: sustainability measures are designed to decrease the carbon footprint of a building thus lessening both the urban heat-island effect as well as the impact on global warming.

QUESTION(S):

What are the economic and other tangible benefits of implementing sustainability measures in both new and existing buildings in New York City balanced with the cost of the implementation? In addition, how are the effects of sustainability measured to provide a clear indication of the benefits?

Provide an assessment of the sustainability practices in various jurisdictions outside New York City and the U.S., focusing specifically on:

- cost of implementation in both new and existing buildings in terms of financial outlay as well as level of effort
- tracking and accountability measures taken by these jurisdictions to ensure the implementation is providing the intended and desired economic benefits any required performance measurements used in these programs

Based on the survey of practices and requirements elsewhere, what practices should the City consider to better ensure that sustainability has an economic as well as environmental impact?

What available technologies are best suited for measuring effects?

CLIENT AGENCY/AGENCIES:

DOB

COMPLETED PROJECTS:

Xiao Yi Chen, Serdar Oztopal and Roberto Pesquera, *Long-Term Capital Investment and Green Construction in New York City* (Columbia/SIPA: 2010); Carrie David, LaVickie Jones, Edna Marinelarena, Jennifer Proulx and Yvonne Wang, *Transitioning into Lifecycle Cost Analysis* (NYU/Wagner: 2011); Jaimie Anzelone, Terri Belkas, Gary Bennett, Iana Dikidjieva and Nicole Wishart, *Modeling the Effects of CEQR* (New School/Milano: 2010); Erik Berliner, *Developing Green Buildings Practices* (New School/Milano: 2009); Will Baker, Shoulong Du, Aalia Kamrani, Fiona Li, Mark Mozur and Maurice Staner, *Benchmarking Municipal Green Buildings Programs* (Columbia/SIPA: 2010); Nana Eduafo, Nicholas O'Brien, Scott Saverance and Karen Villafana, *Bridging Energy Gaps: Energy Efficiency Research in New York City Area* (Columbia/SIPA: 2010); Ian Henri, *Utilizing the Pro Forma Investment Model in a Sensitivity Analysis to Move Toward a Full Cost Accounting of Proposed Built Environment Regulation* (Brooklyn Law School/Corporate and Real Estate Clinic: 2011); Joe Stampone, Justin Chu, Andy Grover and Leon Hovsepian, *Sustainable Design Incentives and Mandates: Global Best Practices and Recommendations for the NYC DOB* (NYU/Schack: 2011)



How to Design Incentives for Sustainability Implementation?

COMPLETED PROJECT:

Joe Stampone, Justin Chu, Andy Grover and Leon Hovsepian, *Sustainable Design Incentives and Mandates: Global Best Practices and Recommendations for the NYC DOB* (NYU/Schack: 2011)

BACKGROUND:

The City of New York along with a multitude of other cities across the nation and world over the last 5-10 years have been looking to implement sustainability measures in buildings and homes as a way to increase energy efficiency, decrease their carbon footprint, and in a broader way improve the quality of life of their citizenry. Some of the sustainability measures include the installation of white or green roofs, micro-turbines, solar panels, LED lighting, and gray-water systems, among a number of other available building technologies. Since there are relatively few laws on the books requiring sustainability implementation and a necessary phased-in approach in the laws that do exist, municipal governments and local jurisdictions have begun to incentivize these sustainability measures in an effort to increase their implementation in buildings where they might have a greater impact as well as across of a broader section of the building stock.

As a result of prior analyses performed during a 2010-2011 Town+Gown project on this question, the City now has a comparative analysis of more than 30 cities, looking at best practices and standards across the full range of potential incentive structures, with recommendations on how different incentives could be applied to the City, showing risks, benefits, and challenges for each. The research also identified data gaps.

QUESTION(S):

What would modeling various incentive options for fiscal impacts reveal?

What are the effects of incentives on actual green building production?

CLIENT AGENCY/AGENCIES:

DOB



What Are Best Practices for Public-Private Partnerships to Promote “Green” Projects?

BACKGROUND:

The scope of the contemporary sustainability agenda has extended to all aspects of the Built Environment. Some “green” projects using innovative technology related to types of infrastructure capable of being operated as a utility can be financed and constructed via the public-private partnership methodology which includes third-party financing. Other types of public structures are less obviously translatable to such construction/financing methodology, but may be possible.

QUESTION(S):

For the various “green” investments related to energy demand side operations and storm water management operations, what public-private partnership practices/vehicles have been used by public owners for investment in such technology as well as other types of projects?

Among the practices/vehicles identified, how could they work in the City setting—for both capital project development and life cycle operation and management—and what would the trade-offs from an application be?

What are the opportunities and impediments for the City to use such practices/vehicles?

What are the best practices for energy savings and waste-water management investment in “green” projects?

What available technologies are best suited for quantifying and reducing greenhouse gases to improve urban air quality?

CLIENT AGENCY/AGENCIES:

DEP, DDC

\$ Landmarking in the 21st Century: What is the Impact of Commercial Landmarking on Economic Development?

BACKGROUND:

The City's expansion of landmarking commercial structures, from individual designation of commercial structures to commercial districts, raises the question of the impact of landmarking on economic development. While there have been some studies of the impact of residential landmarking, the area of commercial landmarking appears open. Apart from the value of historic preservation as historic preservation, it has been asserted that historic designation can be a tool for economic development. Yet historic preservation imposes a regulatory scheme on the buildings it covers in addition to the various other regulatory schemes that cover most or all buildings, such as the zoning resolution and related processes, environmental reviews, the building code containing safety regulations and environmental regulations. Moreover, the City has been enacting new laws, with associated regulations, aimed at environmental sustainability concerns. Historic regulation, in concert with all existing regulations, could exert a countervailing force on its impact as an economic development tool.

QUESTION(S):

To what extent can analytical methodologies for assessing the impact of residential landmarking be applied to commercial landmarking? What kinds of adaptations would be necessary to create a model for commercial landmarking impacts? Are there alternative analytical methodologies?

What role does the structure and methodology of the City's zoning resolution, enacted 50 years ago in 1961, play in the demand for landmarking of commercial structures? in the design of new structures?

What role does the aggregate cost of building construction and building operation regulations play in the design of new structures?

To what extent could the sustainability agenda, with its

emphasis on re-use of existing resources, complement or even supplant part of the historic preservation function?

How would one design a model to test the impact of historic designation of commercial structures, in conjunction with the regulatory environment of which it would become a part, on economic development of the area surrounding the individually designated buildings, and in the case of district designation, economic development of the district and the greater area of which it may be a part?

Assuming access to commercial building data from areas where a number of individual designations exist and from historic districts of commercial buildings, what does the data applied to the model suggest?

CLIENT AGENCY/AGENCIES:

LPC

COMPLETED PROJECTS:

Daniella Bonilla, Mireille Martineau, Chris Minniti and Maria Pedroza, *Landmark Designation: How Do Other Cities Do It?* (NYU/Wagner: 2010); Jennifer Efron, *Landmark Designation: How Do Other Cities Do It?* (Brooklyn Law School/Corporate and Real Estate Clinic: 2009); and Ian Henri, *Utilizing the Pro Forma Investment Model in a Sensitivity Analysis to Move Toward a Full Cost Accounting of Proposed Built Environment Regulation* (Brooklyn Law School: Corporate and Real Estate Clinic: 2011)



How Does the Environmental Sustainability Agenda Expose the Limits of Construction Industry and Governmental Organization?

BACKGROUND:

The traditionally fractured nature of the construction industry and the balkanized nature of sub-units within public owners and among public owners with overlapping jurisdictions have become newly highlighted as a result of the widely embraced environmental sustainability agenda. Much of what the environmental sustainability agenda seeks to accomplish is effected through the built environment and affects the built environment. As the environment does not respect jurisdictional boundaries, neither does the environmental sustainability agenda's intent to make explicit both positive and negative externalities—in particular imposing the true costs of modern activity on parties to economic transactions. Within this new paradigm, the realities of the traditionally fractured construction industry and the traditional hierarchical and often siloed and bureaucratic public sector entities present a challenge. Further, the realities of the environment present a challenge for effective governmental responses under existing jurisdictional boundaries.

QUESTION(S):

As a foundational analysis, how does the environmental sustainability agenda expose the current limits of the construction industry and governmental organization?

CLIENT AGENCY/AGENCIES

DDC



Investigations into Causes: The Incidence of Corruption Cases in Construction

BACKGROUND:

Anecdotally, there seems to be a relationship, within any jurisdiction, between the incidence of corruption cases initiated by law enforcement agencies and the economic cycle. There also seems, anecdotally, to be a relationship between such incidence and regulatory complexity. Moreover, governmental jurisdictions that do business with the same construction firms often follow significantly different practices in how they address incidents of past corruption in determining the responsibility of their potential vendors. To the extent analytic techniques can identify statistically significant relationships, and legal/policy research can identify the different approaches followed by various jurisdictions, there is a space for policy makers to pursue further analyses and possibly consider policy initiatives based on such analyses.

QUESTION(S):

As a foundational analysis, what appears to be the relationship between the incidence of corruption cases initiated by law enforcement agencies and various economic indicia, such as the business cycle, employment rates, regulatory complexity?

What types of analyses are possible to further investigate the apparent relationships?

When incidents of corruption occur, how do various governmental jurisdictions (other than the City) respond, and how do those differing responses affect competition, pricing and quality in public construction?

CLIENT AGENCY/AGENCIES:

DDC, MOCS

Investigations into the Nature of the Public and the Private Owner

BACKGROUND:

To say there are public owners and private owners, in the context of the archetypal construction participants, is simply the beginning of the analysis. While public and private owners share concerns, there are critical differences between them. Further, for government to regulate the industry efficiently and effectively, an understanding of variations in the private sector owner archetype—what they are functionally (owner-developers, build-to-own-and-operate-owners, owners as financing vehicles) and what their respective business forms and operating models are—is essential. It should not go without noting that government as regulator often regulates itself as owner. Finally, a public owner coterminous with a level of government is divided functionally into many operating/line agencies responsible for different built environment structures/functions and into oversight agencies responsible for discrete administrative functions with related institutional interests that may be at odds with each other at times as well as with the construction process.

QUESTION(S):

What issues are shared by public and private owners, *qua* owners?

What does a typology map of private owners reveal about the complexity of functions, business forms and models and organizational structures within the term “private owner”?

What does a typology map of public owners reveal about the complexity of functions and organizational structures within the term “public owner”?

CLIENT AGENCY/AGENCIES:

DDC



Investigations into the Nature of the Financing of Construction

finance, and, within the private credit area, among the various forms of development and ownership models?

CLIENT AGENCY/AGENCIES:

DDC

BACKGROUND:

It is not unusual to reduce the complex world of construction into the archetypal participants of Owner, Designer (architect and/or engineer) and Contractor (as the party in contract privity with the Owner on the one hand and with the various sub-contractors on the other). Yet that paradigm tends to obscure the role that the financing party plays on each and every project. The fractured nature of the construction industry, which is mirrored to an extent in the academic disciplines and professional programs, tends to create a hard divide between the financing of construction projects and the actual construction of projects. Yet across public and private sector projects, the requirements imposed by the financing are hidden imperatives as forceful as the various applicable regulations that are more transparent and generally better understood by comparison. There are a menu of financing vehicles on the private side that appear to match up to the construction industry deconstructed along building type and builder organization type and related business model. It is critical to complete the construction paradigm by investigating and analyzing the nature of public and private construction financing and the impact that requirements imposed by financing, as a general proposition, have on the construction process and on the jobsite.

QUESTION(S):

What features are common across all construction finance structures? What features differ and how?

What is the impact of construction finance requirements on the construction process and on the jobsite?

To what extent and in what ways do standard finance provisions relate to standard construction provisions? To what extent do finance provisions require particular allocations of risk in the contract?

What are the differences among the financing vehicles, for example, between private credit loans and tax-exempt

\$ How Does New York's Regulatory Complexity in the Licensure of Built Environment Participants Affect the Efficiency of the Construction Industry?

COMPLETED PROJECT:

Timothy Kane, *Construction Licensure Schemes in New York and Construction Licensure Analysis* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2011)

BACKGROUND:

To the extent that unexamined State and local government regulations create regulatory complexity within the fragmented construction markets, they may operate as inadvertent barriers to effective competition and may unnecessarily limit the positive impact of construction on the economy. It is the realistic possibility of competition from other markets that mitigates the negative impacts of these fragmented local markets. In New York, licensure of built environment participants is split between the two levels of government. The State licenses what it considers to be professionals while it deems the licensure of those it does not deem to be professionals to be a matter of local concern and delegates such regulation to local governments. Regulatory complexity created by local regulation of the non-professional participants may, in conjunction with other factors, have a negative impact on market entry decisions, rendering local construction markets less competitive. As environmental sustainability does not respect local jurisdictions, neither does economic efficiency of the construction industry. Building on a foundational legal analysis of the regulation of built environment participants in New York City, this project would focus on the economic impacts of such a regulatory scheme on the markets affected by such regulation.

QUESTION(S):

What public policy and economic issues are raised by such statutory schemes?

What is the relation of such statutory scheme to the functioning of the construction market(s) so regulated?

CLIENT AGENCY/AGENCIES:

DDC



Multiple Investigations into Integrated Project Delivery and Building Information Modeling

BACKGROUND:

Some design management techniques and project management tools emerged from the industrial design field and were applied to construction, while others emerged from the construction field itself. Despite their different origins, successful techniques share a basic precept that the earliest practicable and continuous application of these techniques, including all relevant participants and stakeholders in the process, works best for the project at hand. The newest entrants to the firmament consist of a technological tool—Building Information Modeling or BIM—and an innovative service delivery methodology—Integrated Project Delivery or IPD.

BIM originated from parametric solid modeling (PSM) software used in the automotive and aerospace industries, and as these software platforms evolved and became less expensive, they migrated into the field of physical structures. BIM can hold large amounts of data—spatial, schedule and cost—permitting users to explore various building designs at the earliest possible stage as well as the inter-relationships among design, constructability, schedule and price. Public owners have been using BIM, though their ability to fully exploit its benefits is limited when a public owner can only use the design-bid-build methodology which imposes a temporal divide between the designer and contractor.

IPD is an innovative relational contractual arrangement in which the owner, designer and contractor, manage project risk by contractually sharing, as early as possible in the life of a project, responsibility, risk and reward. Public owners constrained by public bidding requirements that preclude vendor selection based on value as well as contract negotiation, cannot use this innovative methodology.

QUESTION(S):

How does application of BIM or IPD affect existing insurance and surety products?

How does application of BIM or IPD at any phase on a construction project affect the traditional allocation of risk in construction? How does it transfer risk among parties?

How does application of BIM or IPD affect existing insurance and surety products?

How does the current legal environment impede adoption of BIM or IPD on New York projects?

Can a public owner require designers and contractors bidding on projects to use BIM? the same BIM product? a BIM product that is interoperable with programs the City agencies use for post-completion operation and maintenance?

How would a model to evaluate the costs and benefits of requiring open standards on public construction projects be structured?

CLIENT AGENCY/AGENCIES:

DDC



Regulatory Systems and New Regulation—How to Analyze and Evaluate?

BACKGROUND:

Just as the term “infrastructure”, commonly in the form of the “infrastructure crisis”, has emerged from obscurity into public view, so too the term “regulation”, mostly in the form of “regulatory impact” has emerged into public view. Assessing the impacts of existing regulatory systems as well as proposed regulations, in complex and dynamic social systems, such as the built environment or regulated industries, with inter-related and inter-dependent components, requires a contextual approach and multiple methodologies. The field of regulatory impact analysis, not surprisingly, includes within its ambit a range of methodologies to systematically evaluate both negative and positive consequences regulation. The tools of regulatory impact analysis are intended to support and enhance governmental decision-making, from the perspectives of those who govern as well as those who are governed. Beyond the current focus on the budgetary impact of regulation on the government itself, expanding areas of regulation (e.g., environmental sustainability and preparedness) suggest the need for an enhanced ability to evaluate the broader impacts of existing regulatory systems and the incremental effects of proposed regulation.

QUESTION(S):

For those regulatory systems with sufficient periods of effectiveness to permit evaluation, it is first necessary to establish the appropriate evaluation model(s) and required data.

- What would a literature survey of regulatory impact analysis and evaluation suggest to the City as a prerequisite to considering evaluation of any of its long-standing regulatory systems and related processes?
- How might the City, as regulator, design an evaluation plan/model for an ensemble of inter-related regulatory systems and processes? What would the related data needs be?

- To what extent would it be possible to evaluate any regulatory system and related set of processes in isolation from others? How would the City, as regulator, establish priority among various inter-related regulatory schemes?

Fiscal impact analysis of proposed legislation that does not acknowledge and account for the totality of regulatory costs on a regulated activity runs the risk that the legislation, if enacted, will have unintended negative consequences such as pricing out the regulated activity, and with that, the putative benefits of the regulation.

- What analytic methodologies are available to analyze incremental costs imposed by proposed regulations in the context of an existing regulatory framework so that sensitivity analyses can be performed to assess the likelihood of unintended negative consequences of such legislation?

What is the relationship between the level of regulation in a jurisdiction and the need for government to provide subsidies of various sorts to create social goods at desired levels or good as socially desired levels?

CLIENT AGENCY /AGENCIES:

DDC

COMPLETED PROJECTS:

Keiko Aikawa, Ruben Espejel, Sebastian Eugene, Jennifer Singh and Yohei Takashima, *New York City Environmental Review Process Reform* (Columbia/SIPA: 2010); Justin Fusaro, James Mettham, Mark Page, Jr., and Brian Tubman, *Ex Post Facto Rezoning Evaluation Model* (NYU/Wagner: 2010); and Jaimie Anzelone, Terri Belkas, Gary Bennett, Iana Dikidjieva and Nicole Wishart, *Modeling the Effects of CEQR* (New School/Milano: 2010); Meghan O'Malley, *Environmental Impact Review in New York City: Taking a “Hard Look” at Urban Environmentalism* (Brooklyn Law School/Community Development Clinic: 2010); and Ian Henri, *Utilizing the Pro Forma Investment Model in a Sensitivity Analysis to Move Toward a Full Cost Accounting of Proposed Built Environment Regulation* (Brooklyn Law School/Clinical Program: 2011)



Investigations into Labor in Construction

BACKGROUND:

In the world of construction project analysis, a large part of the cost data is labor cost data, simply because all of the on-site work is done by human beings instead of robots. Since construction is not inexpensive, the abundance of labor cost data relative to other cost data tends to point researchers into the direction of viewing and defining the problem as an issue of labor. All issues in the built environment, a complex and dynamic social system, must be considered and analyzed in a contextual manner because it is not possible to adequately understand issues, especially those that touch on labor costs, in isolation from the complex system of which they are a part. The complexity of the environment is compounded by complexity among the participants. For example, one reason for owners to understand the dynamics of labor costs is to discover the points where the application of management tools can reduce or contain avoidable costs. One reason for regulators to understand the dynamics of labor costs and the market is to discover the relationship between existing regulations and economic efficiency.

QUESTIONS:

As a foundational meta-analysis of labor and construction, what are the multi-disciplinary issues to be analyzed?

What issues correspond to what stakeholders?

What would be the priority of analysis of these issues?

CLIENT AGENCY/AGENCIES:

DDC, OMB

LAW

The City, as a law maker, acts in the role of a regulator and policy maker, and those related research questions are found above under Economics. For questions under Law, however, the City acts as an owner, primarily through the contractual relationship between it and its designers and contractors, which is the product of industry standard practice, governing law and past experience. For more detailed background information related to Law issues, please see *Orientation to Policy in the Built Environment*.

What Types of Construction Contract Provisions Would Increase Alignment between Principal and Agent?

tory Consequences of Being a “Public Works”? (chart) (Brooklyn Law School: Corporate and Real Estate Clinic: 2010); Jacob Zambryzcki, *Comparative Contract Analysis: Three Standard Contracts* (Chart), (Brooklyn Law School/Postgraduate Fellowship: 2009); Aaron Edelman, *Comparative Contract Analysis: City Standard Contract* (Chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2010)

BACKGROUND:

The various service delivery models allocate and manage risk among the owner, the architect and the contractor in different ways. The appropriateness of a particular service delivery model depends on the complexity of the project and the internal capacities of the parties. There is no one perfect service delivery model, and the benefits and disadvantages of the models vary with the particulars of the project and the parties. Certain service delivery models facilitate better alignment of the design phase with consideration of constructability issues. And certain service delivery models may facilitate better alignment of the owner’s interests in budget, schedule, safety and quality with the interests of its agents—the architect and the contractor—in construction, especially critical in the construction milieu which is the picture of asymmetric information.

QUESTION(S):

Building upon the work of related prior projects, what types of construction contract provisions would increase the alignment of principal and agent on particular types of projects?

CLIENT AGENCY/AGENCIES:

DDC, MOCS

COMPLETED PROJECTS:

Mathew Dudley, *The Effects of Preemption and Dillon’s Rule on Municipal Home Rule in NY: Limiting Public Construction Contracts to the Design-Bid-Build Service Delivery Methodology and Public Works Service Delivery Methods* (chart) (Brooklyn Law School/Corporate and Real Estate Clinic: 2010); Cecily Goodrich, *Statutes for Public Construction* (chart) (Brooklyn Law School/Clinical Program: 2010); Steven Spada, *What Are Statu-*

\$ Public Construction Project Definitions in Construction Statutes and in Financing Statutes: Meaningful Differences?

BACKGROUND:

In New York, the divide between public construction laws and public finance laws appears quite broad. They share a common feature: the lack of definition in statutes leading to a panoply of case law. But the case law approaches to defining what is essentially the same thing—a public construction project—differ depending on whether the law is part of the constellation of public construction procurement and labor laws or part of the constellation of public finance laws.

QUESTION(S):

What are the differences in the nature of a public construction project under the public construction/labor laws and under the public finance laws?

What historical events and related public policies were behind such differences?

How does the New York State pattern identified in this project line up against other states and the federal government?

CLIENT AGENCY/AGENCIES:

DDC

COMPLETED PROJECT:

Steven Spada, *What Are Statutory Consequences of Being a "Public Works"?* (chart) (Brooklyn Law School: Corporate and Real Estate Clinic: 2010)

What is the Relation between Land Use Law Techniques and Urban Design and Function?

BACKGROUND:

The urban design of cities represents a complex interaction between laws regulating land use, including zoning, and institutional arrangements, politics, economics, technology, and social conditions. In existence for little more than a century, these land use laws, especially zoning, are instruments of public planning and policy and directly impact the visual fabric and functioning of the City's built environment. As legal instruments imposing limits on the use of private property, they tend to be expressed in prescriptive form—setting forth permissible uses as well as site coverage, setback and height limits. As the municipal zoning instrument enters its second century of use, at a time of increasing conceptual complexity resulting from the sustainability agenda, an understanding of the relationship between land use regulations, including zoning, and both urban design and function seems in order.

This multi-disciplinary area exists in the midst of two different kinds of systems—static land use regulation systems, of which zoning is only one kind, and active systems, such as economic development programs with tools that include various types of subsidies. These two systems interact with each other and those interactions, in turn have impacts on various sectors of the economy,

QUESTION(S):

What can a survey of methodologies used by other jurisdictions in their land use regulations, including zoning, tell us about the relation of modern zoning tools and desired effects “on the ground”, specifically the design and function of urban areas?

Using New York City as a case study, what can the evolution of tools used in the City's various land use laws, including the zoning code, tell us about the relation of tools used by the City and the City's distinctive visual fabric and the history of its infrastructure development?

How can government, acting both as built environment

regulator (for public health, safety and welfare purposes) and as economic development policy maker, modulate the static and dynamic systems to achieve particular objectives that change over time? How can the more static systems, such as zoning, become more flexible to respond to unanticipated changes—from technology, from demographics and from re-ordered public policy priorities—without adversely affecting the benefits accruing to property owners from static provisions?

How can evaluation of past discrete zoning actions and tools help inform the development of new tools?

CLIENT AGENCY/AGENCIES:

DDC

COMPLETED PROJECTS:

Justin Fusaro, James Mettham, Mark Page, Jr., and Brian Tubman, *Ex Post Facto Rezoning Evaluation Model* (NYU/Wagner: 2010) and Matthew Lawrence and Christopher Colon, *Zoning New York: a Theoretical Analysis* (Brooklyn Law School/Corporate and Real Estate Clinic: 2011)



How to Assure a “Green” Future—Green Building Regulations and Enforcement?

BACKGROUND:

Green building practices are becoming ever more prominent globally as building developers, owners, and occupants become more aware of their benefits. In order to advance the interest in achieving greater sustainability, many jurisdictions are beginning to allow or require certain green building practices. The Mayor’s PlaNYC has outlined several initiatives that will result in new requirements for buildings in the City. DOB is interested in the results of a wide survey of green building practices elsewhere that assesses the spectrum from planning to regulation to enforcement.

QUESTION(S):

What have been the green building requirements and practices in various jurisdictions outside New York City and the U.S., focusing specifically on:

- specific building requirements and how they were developed
- enforcement of the requirements and operational measures taken by these jurisdictions to ensure the requirements are being followed and associated challenges, and
- any related performance measurements used in these programs?

Based on the survey of practices elsewhere, what practices should the City consider as it pursues implementing new regulations as part of PlaNYC?

CLIENT AGENCY/AGENCIES:

DOB

COMPLETED PROJECTS:

Xiao Yi Chen, Serdar Oztopal and Roberto Pesquera, *Long-Term Capital Investment and Green Construction in New York City* (Columbia/SIPA: 2010); Carrie David, LaVickie Jones, Edna Marinelarena, Jennifer Proulx and Yvonne Wang, *Transitioning into Lifecycle Cost Analysis* (NYU/Wagner: 2011); Jaimie Anzelone, Terri Belkas, Gary Bennett, Iana Dikidjieva and Nicole Wishart, *Modeling the Effects of CEQR* (New School/Milano: 2010); Erik Berliner, *Developing Green Buildings Practices* (New School/Milano: 2009); Will Baker, Shoulong Du, Aalia Kamlani, Fiona Li, Mark Mozur and Maurice Staner, *Benchmarking Municipal Green Buildings Programs* (Columbia/SIPA: 2010); Nana Eduafo, Nicholas O’Brien, Scott Saverance and Karen Villafana, *Bridging Energy Gaps: Energy Efficiency Research in New York City Area* (Columbia/SIPA: 2010); Ian Henri, *Utilizing the Pro Forma Investment Model in a Sensitivity Analysis to Move Toward a Full Cost Accounting of Proposed Built Environment Regulation* (Brooklyn Law School/Corporate and Real Estate Clinic: 2011); Joe Stampone, Justin Chu, Andy Grover and Leon Hovsepian, *Sustainable Design Incentives and Mandates: Global Best Practices and Recommendations for the NYC DOB* (NYU/Schack: 2011)



How to Re-envision the City's Lease Agreement as a Long-Term Relational Contract to Effect Changes in Practice and Policy over Time?

BACKGROUND:

The commercial real estate lease is typically the province of real estate lawyers specializing in the area of commercial real estate and it articulates the long-term relationship between a lessor/landlord/owner/developer and a lessee/tenant. While there may be variation among individual leases, the lease agreement structure has become fairly conventional and deviations from the standard set of provisions tend to require the calculation of costs.

The City, in addition to its role as an owner, also acts in the role of lessee, when it decides to lease the space it needs for agency programs instead of constructing and owning it. These leases can take the form of highly complex capital leases in which part of the rent consists of capital funds to pay for the build out of the space or of simpler landlord/tenant arrangements. The uses at City-leased spaces range from agency administrative functions, where few members of the public visit, to service provision functions, where significant numbers of the public interact with agency personnel each day, either for customer-based services or for sensitive human services needs.

The City, as regulator, generally legislates restrictions on building construction and post-construction building use, taxes property owners, and sometimes adds further mandates to achieve various social goods. The set of laws under which lessors operate give rise to some of the operation and maintenance costs against which tenant rents are assessed, which are also constrained by the state of the economy and the commercial rental market.

City-wide policies and practices, as well as individual agency policies and practices, change over time. Policy and practice changes that also require changes to physical spaces are easier to achieve in City-owned spaces than in leased space after execution. While standard lease agreements provide for amendment after execution, they invariably require the lessor's permission to make any changes affecting the structural integrity of the premises.

QUESTION(S):

The issues to be explored below concern how a private owner lessor and the City would draft a set of amendment provisions that expressly anticipate that the City will want to conform existing lease arrangements to some future changes in practices and policies. As conceptual case studies for this project, examples of changes include aspects of the City's sustainability agenda not included in regulations, advancing the City's active design agenda and efforts to improve the human services client experience:

How do other public owners with a significant leasing component, such as the federal General Services Administration, handle future change in their amendment provisions? How do programs that provide funds for design and construction by others ensure certain standards for functionality and design? What other long-term relational contract types could serve as models for this type of amendment provision?

What would be the elements of the costs of (or savings from) expressly articulating and planning for the possibility of such changes in the future?

What categories of costs/savings would likely be involved in—and what party would be appropriate to bear the costs of/enjoy the savings from—the following case study changes to existing lease agreements:

- implementing non-statutory environmentally sustainable green practices
- advancing elements of the City's active design agenda
- enhancing the social services experience for those seeking out the City's human services?

CLIENT AGENCY/AGENCIES:

DCAS, DDC

TECHNOLOGY

The City has an interest in technology solutions as an owner, and the research questions listed below under Technology are related to government in its role as owner on particular projects. Yet government can exercise a powerful role in advancing technology innovation, as economic policy maker, by subsidizing the research and development necessary for innovation in construction technology. Research questions related to this role will be found under Economics. For more detailed background information related to Technology issues, please see *Orientation to Policy in the Built Environment*.



How Might Roadway Technology Mitigate Negative Impacts of Road Infrastructure Reconstruction?

BACKGROUND:

The City's diverse capital program rehabilitates, maintains, and expands the public infrastructure of a large and complex built urban environment. DDC's Infrastructure Division is dedicated to roadway reconstruction, combining planned water and sewer reconstruction with planned upgrades of City streets. Routine street reconstruction is an essential part of keeping the City's infrastructure in a state of good repair and likely has an impact on the economic vitality of business districts and property values of residential districts. The recent federal stimulus bill underscores the important relation of capital infrastructure projects to the economy. There may be, however, some negative local economic consequences during construction that emerging technology might help mitigate.

QUESTION(S):

What would a literature survey of the impacts of roadway construction on business activity during construction and a complementary literature survey on recent innovative technology in roadway design and construction practices suggest to public owners such as the City? What do other agencies and local governments in the State and across the country do to mitigate disruption during roadway construction? What are best practices and technologies?

What planning techniques are available to mitigate negative impacts of roadway construction?

Based on the results of the literature survey above, how might the City design a quantitative analysis to evaluate the impacts on local businesses of roadway reconstruction during project duration?

CLIENT AGENCY/AGENCIES:

DDC



What is the Impact of Innovative Technology on Project Performance and Budget?

BACKGROUND:

The City has a dual role with respect to Built Environment research and development. As an owner, the City has an interest in the application of innovative technology on its projects, and, as an economic policy-maker, the City has access to strategies to increase research and development generally within the local construction market. The City has, in the past, adopted innovative technology in roadway construction but it has not gone back to evaluate the increased efficiency and/or effectiveness of such technology.

QUESTION(S):

As a case-study, what has been the impact on the efficiency and effectiveness of the water/sewer systems from the City's adoption of pipe lining technology for projects beginning in the 1970s?

What lessons can the City learn from this earlier adoption of new technology?

CLIENT AGENCY/AGENCIES:

DDC



How to Implement Innovative Information Technology Products in Construction Programs?

BACKGROUND:

The City has a dual role with respect to Built Environment research and development. As an owner, the City has an interest in the application of innovative technology on its projects, and, as an economic policy maker, the City has access to strategies to increase research and development generally within the local construction market. DDC has begun to require contractors to manually document the “as built” condition of completed projects, noting changes to the original project plans that occurred during construction as a result of unknown conditions below the surface, and DDC is considering the use of information technology in connection with this requirement. Yet, computer technology creates management challenges on the job and technical challenges posed by different data systems within at the reporting contractor and at the agency. Further, the reality of rapid change in the industry makes early adoption of technology perhaps seem unwise.

QUESTION(S):

What would a literature survey on management issues related to the adoption of innovative computer/information technology, with some emphasis on management of construction projects, suggest to a public owner such as the City?

What strategies might the City use to efficiently and effectively implement the adoption of innovative computer/information technology in its roadway construction program?

CLIENT AGENCY/AGENCIES:

DDC



What Modern Mapping Technology Exists for Efficient and Effective Planning?

BACKGROUND:

The City has approximately 5,800 miles of streets, sidewalks, and highways, 789 bridge structures and six tunnels, managed by DOT. The City's street system is a vast network of streets, avenues, and boulevards. In view of the institutional process of street mapping described below, it is always challenging to determine the various characteristics of the status of City streets, such as whether they are mapped or unmapped, whether they are improved or unimproved and who owns them. Streets could be a mapped street, an unmapped street in all five City boroughs, a private street or sometimes a record street. The City's streets, arterials and some highways are generally mapped in the Final City Map and the ownership of these streets is shown in the Damage and Acquisition Maps (a.k.a. Title Maps), which are maintained by the Topographical Bureaus in each Borough President's office. During the last significant restructuring of City government in 1989, many legislative-type functions exercised by the office of the Borough President were modified to become advisory and mediating or, as Jane Jacobs described, locality coordination functions. One function that remained within each Borough President office is the topographical function, which has its origins from the period, before the 1936 and 1961 Charter revisions, when Borough Presidents played a more active role in building regulation and implementation of capital projects. Before the City became a fully built city, local expertise was critical, especially in the absence of today's geographic information system (GIS) technology. Difficulties DOT encounters in determining street status, coupled with advances in GIS technology, suggest the time has come to reconcile a localized function with current technology that permits centralized computer-based mapping, a possible outcome that could also improve public safety which requires a way to relate vanity addresses to actual locations. With a GIS-based street map, DOT could improve its planning activities, working with other agencies to better utilize mapped and City-owned streets that have not been improved for traffic purposes to, for example, create plazas, improve as a street, establish park-and-ride programs, use for parking purposes or lease to private entities.

The City also retains paper-based data on sub-surface conditions across the City gleaned as the result of past projects.

QUESTION(S):

What would a literature survey on topographical functions and techniques in dense urban environments and on current geographic information system (GIS) technology suggest for public owners like the City?

What have other large dense urban cities across the country done since the advent of GIS technology to improve the topographical functions in such cities? What are best practices?

Document a case study of a borough office topographical practice to support possible future plans resulting from the above analyses.

Would it be feasible for the City to add its sub-surface condition data to systems designed for topographical information or would a separate system be necessary?

CLIENT AGENCY/AGENCIES:

DOT, DDC



How Can the City Use Technology to Enhance Road Congestion Management?

BACKGROUND:

Among DEP's many roles is the responsibility to carry out the federal Clean Air Act rules and regulations. As tightening air quality standards loom in the future, technology can play a role in enhancing road congestion management as a method of complying with stricter standards.

QUESTION(S):

What lessons can be learned from other jurisdictions, in the U.S. and elsewhere, about:

- effective new technologies in managing road congestion opportunities and
- impediments in the City for the use of such technologies the cost/benefits of various successful programs

CLIENT AGENCY/AGENCIES:

DEP, DOT

Science, Technology and Society Studies of the City—Shared Metaphors, Models and Knowledge

BACKGROUND:

When a public owner is also a governmental entity with the power to regulate the built environment that is coterminous with its legal jurisdiction, in the form of building codes, restrictions on land use from zoning to preservation, and participant licensure schemes, the multi-disciplinary field of planning becomes one lens through which people can view the collection of built environment artifacts (a.k.a. the city). Planning is a multi-disciplinary field that includes geography, computer science, economics, architecture, law, sociology, political science and history, yet planning in action—public urban planning—is an exercise in politics.

Each of planning's disciplines and other multidisciplinary fields that overlap them also lay claim to a primary or unique understanding of the built environment artifact. For example, architects, in creating the public space on which we act out our public, or civic, lives, have a direct connection to the place of politics. The results of planning exercises and activity are legal instruments, creating rights and legal processes that exist within the intersection of law and politics. Economics has at least a dual role in planning in action, as a methodology to evaluate past planning actions and as an expression of aspirations in planning. The multiplicity of professions necessarily engaged in planning activities often results in a cacophony of multiple voices, each one valid within the confines of its own view of the urban space, with attendant ways of framing problems and solving them. To that cacophony, one can add interest groups, with culled supportive research results, focusing on specific aspects of the built environment artifact—transportation, housing, the natural environment. With all this noise in the system, how can a public owner with planning powers seek to respond to new realities revealed by new needs, changes in technology, and newly conceived aspirations, ideas and policies? How can a public owner/regulator mediate among the competing voices as it works to accommodate an urban artifact to changing conditions as they unfold and as they are projected to unfold?

Oddly enough, concepts and research from the emerging Science, Technology and Society (STS) field of study may provide this ensemble of professionals and members of the public with historical, analytical and metaphorical tools to help foster a common understanding and language for all to use as the urban artifact wrestles with 21st century issues.

QUESTION(S):

What would a literature survey of the STS field reveal to public owners/regulators as possible models and metaphors for a common language and approach to urban planning issues in the 21st century?

What would a survey of academics and public planning professionals on the various models and metaphors reveal for the feasibility of any particular set of approaches?

CLIENT AGENCY/AGENCIES:

DDC



The Brave New World of Public Participation

CLIENT AGENCY/AGENCIES:

DDC

BACKGROUND:

All of the City's built environment processes, from the capital budget and land use processes to the administrative rulemaking process for built environment regulations are set forth in laws that were adopted at a time when the idea of citizen participation in government had remained essentially unchanged from the metaphors of the polis and the New England town meeting. Citizen participation, authorized and at the same time circumscribed by laws, requires face-to-face encounters either in public meetings and hearings and in private meetings, with letter writing as an enhancement and open meetings—or sunshine—laws as a protection.

On the other hand, we have recently been greeted with public expressions extolling the benefits of transparency and the unloading of much public data that used to be quite difficult to obtain during the days of paper-based documentation. The ease of access to public data does not, in and of itself, increase the understanding of the data. The data obtainable to the public is still bounded by "freedom of information" type laws that balance the "knowledge is power" concept against privacy and confidentiality concerns.

QUESTIONS:

How can recent technology impact the public participation process as a technical matter? As a political matter?

What is the gap between the traditional civic models that underlay our current public processes and the brave new world of the plugged-in citizen?

How can recent technology help citizen participants to manage and understand the enormous amounts of data that are now available to them as a technical matter?
What is the role of education?



Technology Investigations into BIM

linking data in BIM and GIS databases on a system wide basis?

How can BIM (with GIS) technologies facilitate better/more successful operation and maintenance plans for public buildings and infrastructure? How can the transfer of information gathered during the design and construction process be facilitated for the lifecycle operation and maintenance of the completed project? How can the design and construction process under BIM be used to anticipate future operation and maintenance issues?

BACKGROUND:

Some design management techniques and project management tools emerged from the industrial design field and were applied to construction, while others emerged from the construction field itself. Despite their different origins, successful techniques share a basic precept that the earliest practicable and continuous application of these techniques, including all relevant participants and stakeholders in the process, works best for the project at hand. The newest entrants to the firmament consist of a technological tool—Building Information Modeling or BIM—and an innovative service delivery methodology—Integrated Project Delivery or IPD.

BIM originated from parametric solid modeling (PSM) software used in the automotive and aerospace industries, and as these software platforms evolved and became less expensive, they migrated into the field of physical structures. BIM can hold large amounts of data—spatial, schedule and cost—permitting users to explore various building designs at the earliest possible stage as well as the inter-relationships among design, constructability, schedule and price. Public owners have been using BIM, though their ability to fully exploit its benefits is limited when a public owner can only use the design-bid-build methodology which imposes a temporal divide between the designer and contractor.

QUESTIONS:

How have owners handled issues related to the need for interoperability of various BIM programs among the participants?

What other technologies can be used in sync with BIM? How can data (surface and subsurface) obtained via 3-D laser scanning and other non-destructive technologies be integrated into BIM? Once such surface and subsurface data are integrated into the BIM program for a particular project, what are the opportunities for linking data in BIM to existing GIS databases? What are the opportunities for

CLIENT AGENCY/AGENCIES:

DDC

DESIGN

Public capital programs generate public architecture that becomes part of the visible built environment. Mayor Bloomberg, in his inaugural address at the Art Commission's 2002 annual design award ceremony, quoted I.N. Phelps Stokes, who presided over the Art Commission under Mayor LaGuardia:

The production of beauty, especially by simple and inexpensive means is a very subtle problem and can be solved successfully only by a combination of ability, experience and care.

This expression of the challenges inherent in municipal architecture—or the City's capital program—provides context for questions under Design.

The City, under Design, primarily acts as an owner and a purchaser of design—architectural and engineering—services. Research questions related to the City's role of regulator of the visible public realm will be found under Management with an Urban Policy Twist. For more detailed background information related to Design issues, please see *Orientation to Policy in the Built Environment*.



How to Incorporate “Long Life, Loose Fit, Low Technology” Design Principles for City Buildings?

BACKGROUND:

Across the spectrum of public uses, there is always the potential for a mismatch over time between long-lived fixed capital assets (and their original design goals) and the changes in the demographics of populations that they were intended to serve as well as general changes in demand for such services. Demographic forecasting techniques are of limited predictive value for long-lived assets. Public owners find it harder than private owners to change policies or practices quickly. It becomes especially difficult for a public owner like the City with a practice of over-building public assets to last “forever” in the face of historical insufficient maintenance activities after construction completion.

This mismatch is further complicated in a highly built urban environment with little available land as a general matter and even less for public projects with certain uses perceived to be negative. Under such circumstances, currently underutilized public assets of many kinds might be considered as resources for future planned and/or unanticipated demand. In view of the limits of demographic forecasting, government needs other tools to help it manage periods when dynamic reality differs significantly with long-lived assets.

This topic has been the subject of two Town + Gown projects: one recommended developing a strategy for flexible design of public buildings going forward. The idea that public structures can be shared productively by multiple human services agencies and groups providing social, educational, cultural and health services, has been discussed since the early twentieth century. Difficulties in coordinating such efforts and in allocating expenses for separate agencies providing services have impeded implementation. Since then, however, the sustainability agenda has placed a focus on “long life, loose fit, low technology” design, and trends in work standards have evolved to include job sharing, telecommuting and flexible co-location of staffs from various offices across an organization.

QUESTION(S):

Building upon prior work, how might the City implement the recommendation to design structures flexibly to permit multiple uses over time and at the same time in order to optimize utilization the City’s capital assets?

Taking the implementation strategy to a more specific level, what specific public building typologies would lend themselves best to a “long life, loose fit, low technology” approach?

CLIENT AGENCY/AGENCIES:

DDC

COMPLETED PROJECTS:

Jennifer Chung, Jorge Ubaldo Colin Pescina, Tanya Fonseca, Heidi Gen Kuong, Christina Ghan, Kye-Joon Lee, Francis Tan and Nathan Tinclair, *Planning for the Optimum Utilization of New York City Schools* (Columbia/SIPA: 2010) and Pablo Arboleda, Christine Flynn, Jose R. Mejia, Taryn Yaeger and Ashley Wessier, *Setting the Stage for the Co-location of Senior Centers in Public Schools* (New School/Milano: 2011)



What Are the Impacts of Workplace Design on Workplace Performance?

BACKGROUND:

The design and construction of workspace, where many spend most of their lives, impact us as individuals and as a society. All levels of government have been transforming their work environments to maximize the value of public office space as the result of earlier government re-engineering and downsizing efforts, the advent of telecommuting and family-friendly work environment initiatives, rapid changes in technology and the need for improved customer services and/or more effective programs serving clients, as well as budget efficiencies. The performance measurement focus in 1990s also created an impetus toward reforming office space planning as the connection between worker performance and the workspace became increasingly clear. At the federal level, linking the planned downsizing of offices with trends in alternative workplace design permitted a reduction in office space costs in ways that minimized the negative impact on agency performance of missions and tasks articulated during strategic planning processes.

Since then, the sustainability agenda has placed a focus on the impact of the environment—external and internal—on human health. Research conducted in the U.K. and U.S. has demonstrated that the most successful labor markets are reinforced by workplaces that are physically and conceptually supportive of their objectives, values and people. These studies have demonstrated that workplace projects can positively influence organizational performance and employee effectiveness, by increasing productivity, employee satisfaction and attractiveness to potential candidates and reducing absenteeism, employee turnover and use of health insurance benefits.

The City does not currently evaluate the contribution of workplace design to agencies' performance, on either administrative or service provision ends of the spectrum, or the fiscal savings that derive from improvements in the workplace. Investigating the incremental increases in agency performance and fiscal savings as the result of such design interventions would enable the City to evaluate future relocation strategies, consolidation efforts,

planning initiatives, technological improvements, changes in management policies, and environmental designs.

QUESTION(S):

What would a literature survey of the relation of workplace design and performance in both public and private sectors suggest for a public employer and public owner such as the City?

Based upon the review of the literature, and using the City's performance-based data, how could a quantitative evaluation model be designed to test the relation between recent renovation or expansion projects involving interior workplace improvements and related agency performance, on either administrative or service provision ends of the spectrum, as well as savings to the expense budget?

CLIENT AGENCY/AGENCIES:

DSNY, DDC

COMPLETED PROJECTS:

Xiao Yi Chen, Serdar Oztopal and Roberto Pesquera, *Long-Term Capital Investment and Green Construction in New York City* (Columbia/SIPA: 2010) and Laura Kurgan and Glen Cummings, *From Waiting Rooms to Resource Hubs* (Columbia/GSAPP: 2011)



How to Diversify the Architectural Vernacular of Affordable Housing?

pare to that of other large cities such as Chicago, Seattle and San Francisco? What do other cities do to encourage variation in design of affordable housing? What are their related cost and zoning constraints?

Affordable housing is a public good, yet its integration within a neighborhood is also critical—what are the elements that make affordable housing successful?

CLIENT AGENCY/AGENCIES:

DCP, HPD, DDC

BACKGROUND:

Through public and private partnerships, there has been creation and preservation over 100,000 units of affordable housing in the City over the last 8 years. There have been recent examples of affordable housing where the architectural quality is just as good, if not better, than the quality of nearby market rate projects, yet the housing construction market does tend toward the identifiable affordable housing typologies. The production of affordable housing occurs within a matrix of interrelated constraints, including economic/financial, physical, regulatory and political constraints. The City's policy goals include providing the maximum number of affordable units to meet the Mayor's housing objective and adding to the affordable housing supply *within currently projected financial resources*. Yet it is also desirable to explore whether and how it is possible, *within such constraints*, to diversify the architectural vernacular of affordable housing in the City to include designs and materials that integrate well within the City's various neighborhoods, for example, row houses, stacked duplexes, stick-built structures and towers other than the more standard double-loaded slab.

QUESTION(S):

What factors surrounding the production of affordable housing, including the cost of building, result in the look of affordable housing?

What tools are available to encourage more variation in design? In construction? Within current cost and zoning constraints?

Within the constraint of providing maximum number of affordable units to meet the Mayor's housing goal and adding to the affordable housing supply within currently projected financial resources, how can the City's public and private partnerships achieve greater variation in housing/construction typology?

How does affordable housing design in New York com-



Investigations into Active Design

BACKGROUND:

Historically, built environment design has achieved positive public health outcomes, from the public water and parks systems, the public sanitation program to housing and zoning laws. In the latter part of the 20th century, built environment design initiatives have ranged from developing pollution control features on factories (and cars) to eliminating toxic compounds from building materials such as asbestos and lead. At a time when the cumulative effect of contemporary planning and design have reduced the need for daily physical activity, public health researchers are now exploiting the relationship between built environment design and public health outcomes in the quest to reduce the incidence of obesity and its related chronic diseases. Physical activity has been found to prevent a host of chronic conditions. To illustrate, parks once provided respite from the week's strenuous labors, and now they must be designed to provide situations for physical recreation, because jobs are sedentary and people commute from home to jobs in a variety of powered vehicles. Contemporary building design—both commercial and residential—has reduced the number of opportunities for people to make up the slack in their physical activity. Active design principles in building design and in planning can increase the opportunities for daily physical activity that can help reduce the incidence of chronic disease.

QUESTION(S):

The City's Active Design Guidelines encourage adjacency between gym and playroom in residential buildings. The safety of children is a concern, since they may wander into the gym unsupervised and exercise equipment and weights could pose a hazard. What is the best separation design that would encourage adjacency and transparency while keeping children free of potential hazard?

Current studies of limited building types indicate that stairs need to be no more than 25 feet from the building entrance to provide an incentive for people to use the

stairs. Does this metric for the distance between stairs and entrances hold for larger buildings (i.e. concert halls, hotel and large educational buildings) and occupancy, and if not, what are the appropriate metrics?

What are optimal design layouts for an office pantry based on the number of staff on shift to encourage healthy eating?

What are optimal design layouts for an exercise room at 800sf, 1000sf and 1200sf in an apartment building to encourage weight training and cardiovascular activities?

Interconnecting stairs in the workplace requires upfront investment. Are there quantitative building performance, productivity and health-related data that could be measured to evaluate the cost-benefit of this architectural design feature?

CLIENT AGENCY/AGENCIES:

DHMH, DDC



Investigations Into Designing the “Below-the- Roadway” Relationship of Public Owners/Utilities and Private Utilities?

BACKGROUND:

Beneath the asphalt on the roadways in many urban centers runs a transport network for private utilities—telecommunication, electricity, gas, steam—and public utilities—water and sewer. Public owners permit private utilities to occupy public space via several legal constructs, such as easements, rights of way or franchises. Since public roadways and the networks below them are dynamic infrastructure, the ongoing relationship must provide for responsibilities during construction, reconstruction and maintenance of the infrastructure as well as the utility elements below.

QUESTION(S):

What is the nature and degree of underground utility network complexity among the large densely populated urban areas?

How do the public works agencies at other cities manage the interaction with private utilities for construction, reconstruction and maintenance activities?

To what extent is the relationship governed by state law and/or regulatory commissions and to what extent is the relationship governed by local law and/or agreement by the parties?

How do other cities structure the legal relationships between the public owner and the private utilities? How do public owners permit private utilities to occupy public spaces? What is the nature of the various relationships?

What technologies and design principles are available to resolve issues present in this complex area?

CLIENT AGENCY/AGENCIES:

DDC



Investigations into Design for Human Services Programs

COMPLETED PROJECTS:

Laura Kurgan and Glen Cummings, *From Waiting Rooms to Resource Hubs* (Columbia/GSAPP: 2011)

BACKGROUND:

The design disciplines have demonstrated a connection between design of the physical environment—both interior and exterior and including physical space, space layout, fixtures and equipment as well as signage—and the functionality of the programs working within an physical environment—both those who work providing services and those who seek services. Surveys of public services spaces have revealed opportunities for agencies to apply design to their programs and spaces in a variety of interventions. These surveys have also revealed endemic Citywide process issues, ranging from funding complexity for certain types of human services programs, inadequate physical asset data including site conditions, physical maintenance needs and space plans and specifications, non-responsive leased-based relationships, a general lack of awareness of the potential for design interventions as part of program evaluation and improvement, and a lack of a systemic feedback loop into the budget process.

QUESTION(S):

What is the relationship between design of the physical environment and program functionality?

Based on existing analyses underway, what systemic Citywide processes create static conditions on the ground at odds with changing programmatic needs within human services programs?

What would a conceptual cost benefit model of various structural reforms look like?

CLIENT AGENCY/AGENCIES:

DDC



Investigations into the Relation of Built Environment Design and Natural Phenomena

BACKGROUND:

The relationship of the built environment to all natural phenomena is much richer than the current environmental sustainability agenda's focus permits us to see and consider. For example, migrating birds fly into glass buildings at night on their flights up and down the coast. Canada geese, once migratory but now resident, are attracted to certain built environment features that conflict with public health and safety concerns and policies. Feral, free-roaming and stray cats thrive in certain built environment and landscape features. Public owners can take advantage of both science and design to improve outcomes for both humans and animals.

QUESTION(S):

For any type of human/built environment/animal interaction with current negative outcomes, what would a literature survey reveal?

For such type of interaction, what design strategies could improve the outcome? What other strategies would be necessary to support such design strategies?

What would a cost/benefit analysis of such interventions reveal?

CLIENT AGENCY/AGENCIES:

DDC



How Can “Long Life, Loose Fit, Low Technology” Design Principles Be Adapted for Institutional Facilities in This Age of Information Technology?

BACKGROUND:

In addition to the potential for a mismatch over time between long-lived fixed capital assets and the demographic changes in populations and service demand, innovative technology also creates the potential for a mismatch. Nowhere is this more evident than in both education and healthcare sectors, where programmatic changes made possible by electronic technologies will have an impact on the physical infrastructure where education and healthcare can be delivered. Advances in health information technology, notably the appearance and later mandated use of the electronic health record, has the potential for transforming not only the way healthcare is delivered but also the physical settings in which it is developed. The advent of distance learning also has similar implications for educational facilities.

QUESTION(S):

The development of information technology, in conjunction with other trends in healthcare and education, is likely to impact the current inventory of healthcare and educational physical assets. What design options are available to permit other uses of redundant or unnecessary physical assets in an environmentally sustainable manner?

What does the future of healthcare delivery or education, facilitated by technology, look like “on the ground”? How can the future of health care delivery or education from a physical perspective be designed?

CLIENT AGENCY/AGENCIES:

DDC



Design Investigations into Management and Environmental Sustainability Issues

BACKGROUND:

Many disciplines claim the built environment as their own domain, none more than architecture. Yet management theories and tools capture the construction process and those that include a design management aspect also include the design phase. And, the growing list of laws adopted to increase the environmental sustainability of built environment objects and process will continue for the foreseeable future as we continue to understand the relation between the built environment and the natural environment. With so many other disciplines involved in the regulation of the built environment, the need for the architect to assess the impact of these non-design interventions on aesthetic and design imperatives will continue to grow. Over time, unintended negative consequences will become apparent, first to the architect and later to the other disciplines and the general public. The architect's ability to analyze design consequences will enable the design sensibility to inform public policy debates on subsequent built environment legislation.

QUESTION(S):

What impact does the use of Building Information Modeling have on the design process and end results?

How are the changing environmental requirements impacting the design process and end results?

CLIENT AGENCY/AGENCIES:

DDC



How to Increase Design-Focused Research and Development?

BACKGROUND:

The City has a dual role with respect to Built Environment research and development. As an owner, the City has an interest in the application of innovative technology and thinking on its projects, and, as an economic policy maker, the City has access to strategies to increase research and development generally within the local construction market.

The difficulties associated with increasing research and development, as a general matter, in the historically conservative and fragmented construction industry are multiplied when considering how to increase research and development—in particular, hard building research sensitive to design imperatives—within the architecture academe.

QUESTION(S):

What would a literature survey of architecture-led research and development suggest for public owners such as the City?

Based on examples of successful architecture-led public sponsorship of research and development, what strategies could public owners use to increase the incidence of architecture-led research and development?

CLIENT AGENCY/AGENCIES:

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