What Can Public Built Environment Data Tell Us?
A Town+Gown Symposia Event
New York Public Library Branch @ 455 Fifth Avenue
April 25, 2012 (8:30 a.m. to 10:30 a.m.)

TOWN+GOWN

August 2005   Public Information: A "Zero Sum" Game. Charter revision commission deferred its proposal to create entity to review charter-mandated reporting requirements for continued relevance and effectiveness and recommend revisions or elimination.   While many surveyed noted that some mandated reports (or parts) were no longer as useful or relevant as originally intended, they were also reluctant publicly to admit it and support elimination of any mandated reports for fear of not receiving anything better. (*See* Commission, pp. 54-63)

August-November 2010   Public Information: A Changing Environment. Next commission adopted the deferred proposal, putting it on the ballot. City voters approved the proposal to create the Report and Advisory Board Review Commission (RABRC) to review and assess the continued usefulness of certain requirements for reports and advisory boards (City Charter § 1113).

May 2011   Road Map for the Digital City released, establishing a comprehensive strategy to make New York the nation's leading city in its use of digital information in its interactions with its citizens.

June 2011   Local Law 40/2011 adopted, requiring posting of mayoral executive orders issued on or after January 1, 1974, and city memoranda of understanding or similar agreements materially affect public rights or procedures on the city's website.

October 2011   NYC Open Data Portal officially launched, containing nearly 750 data sets from 60 city agencies, commissions, and business improvement districts, and providing the data for the city's first "big app" competition.

February 2012   Local Law 5/2012 adopted, requiring the city to post material terms of city contracts on the city's website. RABRC holds its first organizational meeting to discuss its charter-mandated responsibilities and the initial stages of its work.

March 2012   Local Law 11/2012 adopted, leading to a comprehensive city-wide open data policy at the city and creation of a single web portal available to the greatest number of users where agencies will post their data in a format to facilitate the greatest number of applications, fully effective in 2018.

Now that access to public data is no longer the problem it once appeared to be, we can turn our focus to what researchers on both sides of academic/practitioner divide can do with the public built environment data.

Context is Everything in the Built Environment.   From a single built environment artifact, it is possible to investigate issues related to its planning, its construction and finance, and its life-cycle operation and maintenance and ramp up that information, along with the information for similar projects, via various analytic paradigms to assess the systemic issues facing a range of built environment participants.

$$\sum_{i=1}^{n} Project_i = Project_1 + Project_2 + Project_3 + \ldots Project_n$$

Formal academic disciplines are related to these various systemic issues, such as urban planning and zoning, public finance, real estate finance, capital program management, service delivery methodologies and tools, contractual forms and case law. Formal disciplines are also related to the ensembles of artifacts viewed as

systems generating specialty policy areas—transportation, housing, environmental sustainability.

But the traditional research methodology described above requires investigation of a particular issue within a particular area supported by available data, using the touchstone of a research question. Theoretically, the aggregate of all traditional research could inform understanding of this area, but in reality, the built environment is a complex social system and this approach will not suffice.

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Tyranny of the Research Question

Scene:  Lunch at small restaurant near local
graduate school

Academic:  So, how do you like your
new job?
Practitioner: It's great! I have access to
all this data now and I can do some of the
stuff I've reading about! Problem is, I
threw out my statistics notebooks and
I don't even remember how to start. What
about we go through the data together and
figure out what kinds of analyses we can do
with it?
A (sadly):  Don't you remember what we
taught you in school? What is the research
question? You need a research question.
P:  But there could be ten—a hundred—
research questions in that data set! I don't
know what they all are! Okay, okay . . .
here's one . . .
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The traditional research paradigm produces fractured built environment research that mirrors the fractured condition of built environment industries. This type of research cannot be effective—*viz.* of practical use to those working in the complex social setting of the built environment. While it is likely that the built environment is susceptible to changes in policy and practice based on analysis, it is necessary to lower the barriers to research imposed by this complex and fractured conceptual space. (*See* Jenkins-Smith, pp. 103, 118) It is thus necessary to go outside traditional academic approaches to research, first to clear structural hurdles that inhibit practice-based research and then to deal with complicated data sets generated for reasons other than pure research by the complex inter-related processes.

It was six men of Indostan
To learning much inclined,
Who went to see the Elephant
(Though all of them were blind),
That each by observation
Might satisfy his mind. * * *

And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were in the wrong! * * *

John Godfrey Sax, *The Blind Men and the Elephant*
http://en.wikisource.org/wiki/The_Blindmen_and_the_Elephant

Systemic Action Research Can Clear Structural Hurdles.
The Town+Gown program was modeled as a systemic action research program in order to clear the structural hurdles responsible for historically low levels of useful applied built environment research. These hurdles include low levels of investment, low levels of public sponsorship, inadequate linkages between research and application, and the fragmented nature of the construction industry, which is mirrored by the similarly fractured results produced by traditional research methodologies. In the systemic action research process, both practitioner and academic participate as equal partners in knowledge creation and multiple modes of inquiry and analysis are not only acceptable but also acknowledged as necessary within the complex and dynamic social system where issues require the relevant context in order for participants to understand and analyze them.   This open process, with multiple participants, perspectives and research methodologies, leads to an iterative cyclical feedback process over time, with research leading to action of many types, including further research. (*See* Burns)

***Traditional Research Model Limits Results—Illustrations.*** Three completed Town+Gown projects demonstrate the challenges faced by research in the absence of a "context- and environment-dependent framework." (*See* Ammar, Wright and Selden, p. 449) All of these projects focused on the city as a public owner, as distinct from the other roles it plays in the built environment, such as regulator and economic policy maker. (*See* Myers, p. 15)

The first research team was asked to provide a conceptual model to allow the city to control the burden of capital projects on operating budgets over the long-term. (*See* Foster *et al.*) After identifying existing administrative and political constraints, the team found that a high public debt burden has negative effects on operating budgets, both at the city and elsewhere. The team concluded that the constraints at the city, such as participation in the budget process by a wide range of political actors, agencies' perceptions about capital funds and the cost of additional budgeting monitoring, were likely to render tools from other jurisdictions infeasible. The team's recommendations were intended to operate within the existing budget process, and included developing more robust information as part of the budget development phase, focusing more rigorously on changes to the financial plan, and systematic improvements to the monitoring function.

The approach of expanding on opportunities present in the current process for collaborative long-term planning has long been advocated by many observers. (*See* Financial Control Board) That similar proposals have yet to work or even be tried suggests that more is at play in this complex social setting. Picking up from the first project, the second researcher specifically focused on the impact of the politics surrounding the capital planning and budgeting processes on capital program costs. (*See* Bennett) The central research question consisted of deciding when, during the capital-planning-to-project execution continuum, it is appropriate to establish a baseline project cost estimate against which to evaluate cost increases. Since the few existing studies focused on mega-projects with unique characteristics, the researcher identified several analytic models and evaluated them against comprehensiveness and feasibility criteria. Of the five identified analytic models—the city's *status quo* process, cost-benefit analysis, financial risk-assessment, temporal risk-assessment and reference class forecasting—the reference class forecasting model ranked highest in providing information, while capturing economic, temporal and political considerations as a whole. The researcher recommended the city use the reference-class forecasting model in order to accurately capture the effects of politics on the capital planning and budgeting processes and on capital project costs.

In the last project, the research team analyzed project data in the context of managing project schedule

volatility. (*See* Ayala *et al.*) As with all Town+Gown projects to date, there is a paucity of city-based research upon which to draw. The team, thus, began with a quantitative analysis of DDC project data, first, to identify the city capital project processes and related metrics, and then, using regression techniques, to identify case study projects for a qualitative assessment, all of which would then provide the foundation for designing a risk-based model. Case study interviews confirmed aspects of the quantitative analysis and supplemented the data to permit the creation of process maps.
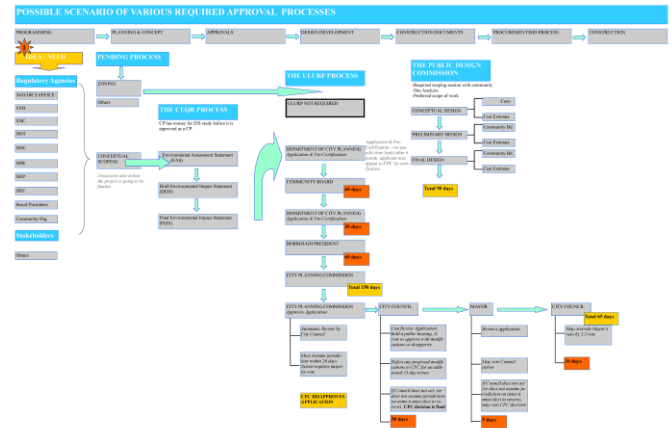
Source: Ayala et al.

While noting that long duration of the design phase may not always be negative, the team found that longer design duration did not lead to shorter construction duration. Most project types in the data set evidenced high uncertainty during the design phase and, after normalizing certain benchmark terms, actual delay during the design period was considerable for certain project types. Weak correlation of factors with design delay proved to be an obstacle for creating a predictive risk-based model. The team identified the outlines of a model and data gaps, suggesting a number of steps to create the necessary data over time to permit creation of a model.

Fuzzy-Rule Case-based Reasoning Can Clear Methodological Hurdles. Just as the systemic action research methodology provides a way to bridge the practitioner-academic divide for effective research in the complex system that is the built environment, the case-based reasoning methodology provides a way to link the various disciplinary paradigms at work in the built environment. (*See* Watson) As built environment participants collaborate over time on the many inter-

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related research projects, we will need to develop a systemic framework into which these projects fit and which will help participants make sense of individual analyses in the context of a complex system, with a view toward making changes in practice and policy informed by such analyses. Moreover, it will be necessary to develop a methodology that encompasses the related analyses and makes sense from both the "top down" perspective and the "bottom up" perspective. After we develop a full and interrelated understanding of what the various participants mean by "success," it will become possible to make effective changes in practice and policy that also minimize unintended negative consequences.

There have been several promising efforts applying the case based reasoning methodology to evaluation of financial management performance of entities, several of which were entities in New York State. Since evaluating the performance of an entity's capital program is not unlike that of its overall financial management, this methodology could be applied to the built environment setting focusing on the city as a public owner and, possibly, as a regulator. These efforts succeeded in marshaling data sets from complex systems characterized by multiple components with hierarchical interactions, lots of measurement and information and relationships and judgments that are difficult to model. (*See* Ammar, Wright and Selden; *see also* Ammar, Duncombe, Jump and Wright).   This case based reasoning methodology, called "fuzzy rule based system," was developed in collaboration with system participants and has become a "consistent means for applying multi-criteria judgment in a manner that is replicable and explainable." (Ammar, Wright and Selden, p. 450)

A multi-level expert rule based system with fuzzy logic controls permits a systemic and context-based evaluation of an entity's capacity to perform certain complex functions, such as capital project planning, construction and finance, in contrast to isolated evaluations of output performance measures, the typical products of the traditional research methodology. (Ammar, Wright and Selden, p. 449)

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