



TOWN +GOWN: NYC

Culture+Data for Better Capital Project Delivery

ACS Manhattan Conference Room
@150 William Street, 19th floor

November 14, 2019, 9:00 a.m. to 1:30 p.m.

AGENDA

9:00 a.m.—9:15 a.m.

Registration, Introduction and Welcome

9:15 a.m.—9:30 a.m.

Update on Systemic Construction Data Analysis Project with Columbia/Data for Good (DFG) Program

Terri Matthews, Town+Gown: NYC

9:30 a.m.—11:00 a.m.

Culture for Better Capital Project Delivery

Moderator: Terri Matthews, Town+Gown: NYC

Integrated Project Delivery Principles

Professor Francisco Pineda, Columbia/School of Professional Studies

Rapid Alignment Initiated Delivery

Professors Andrew Bates and Frank Darconte, NYU/Tandon

Progressive or Collaborative Design-Build

Steven Charney, Esq., Peckar & Abramson

Case Study: EDC and DB

Patrick Askew, NYC EDC

11:00 a.m.—12:30 p.m.

Project Management Tools and Techniques for Better Project Delivery

Moderator: Michael Giaramita, Group PMX

LEAN

Sam Spata, Exyte

Building Information Modeling

Professor Lennart Andersson, Pratt

Professor Andrew Bates, NYU/Tandon

12:30 p.m.—1:30 p.m.

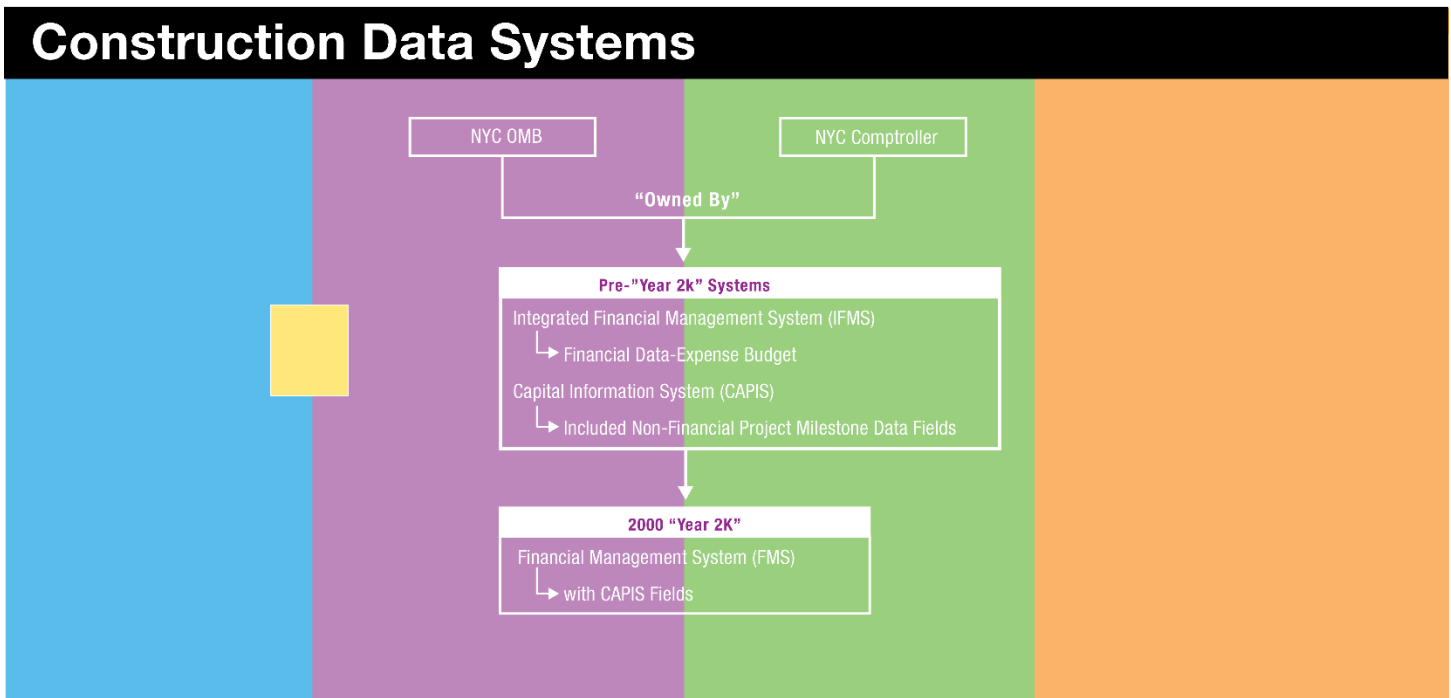
Metrics that Matter--Discussion on Connecting Culture and Project Management to Data

Moderator: Professor Frank Darconte, NYU/Tandon

All presenters from the morning will participate in this panel discussion

Event Genealogy. This event combines the work of two Town+Gown series. The first has focused on data analysis in construction/built environment, and the second has focused on improving capital project service delivery.

On Data. In our first series of Symposium events, in 2011-2011, when the City initiated its “open and big data” efforts, Town+Gown began to focus on what construction-related data could tell us because there were a number of research questions in the Research Agenda that required construction-related data to resolve.¹ Construction project-level administrative data are generated and retained at the citywide process level and the managing agency level. The city’s capital planning and budgeting, procurement, contract management and claims processes generate much digitized data on all public projects that are generated by and reside within each agency’s data systems. Additional “granular” project-management-specific digitized information is generated by and resides at managing agencies.



Context is everything in the built environment, especially at the construction project level, and the data analytic approach, properly informed, could help with the limits of the traditional research methodology. Exploring large data sets to identify insights and possible correlations seemed to clear the hurdle that traditional research posed due to the requirement that an initial hypothesis be tested with existing administrative data that were not created explicitly for research purposes.²

¹ See <https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/04-25-12%20Precis.Final.pdf>.

² *Ibid.*, pp. 3-4, for a discussion of the “fuzzy-rule” case-based reasoning approach.

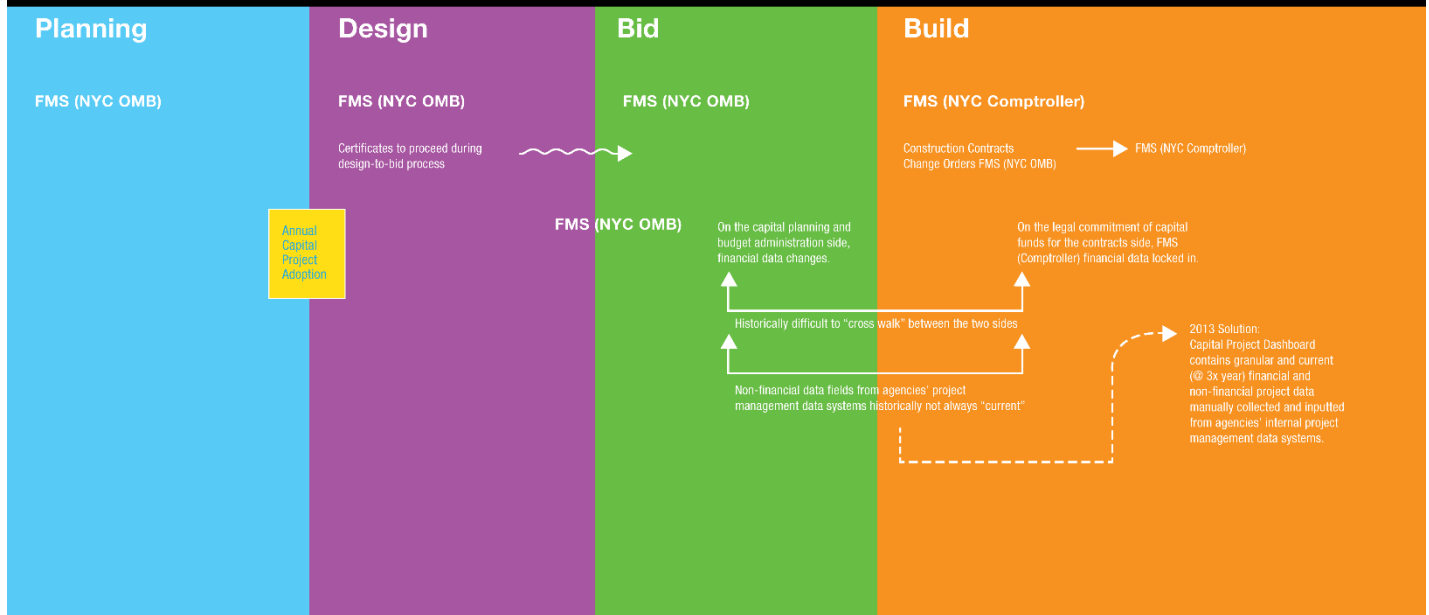
For three academic years, starting in 2014-2015, Town+Gown worked with student researchers on experiential learning engagements, using construction project and other construction-related administrative data from one construction agency, to explore various aspects of the construction process.³ These student-led research projects stand for the proposition that construction-related administrative data are amenable to standard data analytic and statistical techniques to identify concepts for future research within Town+Gown. The actual findings from these “exploratory” or “speculative” investigations were considered less important than the fact that these techniques, when applied to administrative data, can point to potential areas for (1) changes in management policies and practices based on research and (2) root cause analyses within a broad systems analysis approach aimed at systemic policy and practice changes in the planning, budgeting and implementation phases of the capital process, involving all system stakeholders.

Fast forward now to the 2018-2019 Symposium event series, after years of agency-specific construction data analytics. These projects gave rise to the idea behind the November 9, 2018 Symposium event, *Issues in Systemic Construction Data Analysis: Top-Down, Bottom-Up and Middle-Out*,⁴ that used agency-specific data analysis, which aims at agency-specific management improvements, as a point of departure to move up a level to discuss how data analysis using multiple agency data sets and external data sets could integrate and expand data analytics with broader policy analyses to look at larger system “wicked” problems. System-wide analysis requires collective identification of the right questions to study, the appropriate analytic methods, data sources and challenges. A collaboratively designed methodology would require those with domain knowledge to think about how the different pieces of the system relate to one another and how a collectively pooled data set could paint a high-level portrait of the system, thereby allowing development of system-level questions. After establishing the right questions, the stakeholders would engage in a diagnostic process to identify data gaps and places where data collection, production and organization could be shifted in relatively low-cost ways to create system-wide data sets to answer or better inform the “wicked” problem questions that matter.

³ See https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/T+G+BI_V6.pdf and https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/T+G+BI_V7.pdf; see also <https://vimeo.com/215532183/1ff5f29c70> @ <https://www1.nyc.gov/site/ddc/about/town-gown.page>.

⁴ See <https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/Construction%20Data%20Precis.Final.pdf>.

Construction Data and the Capital Program Process



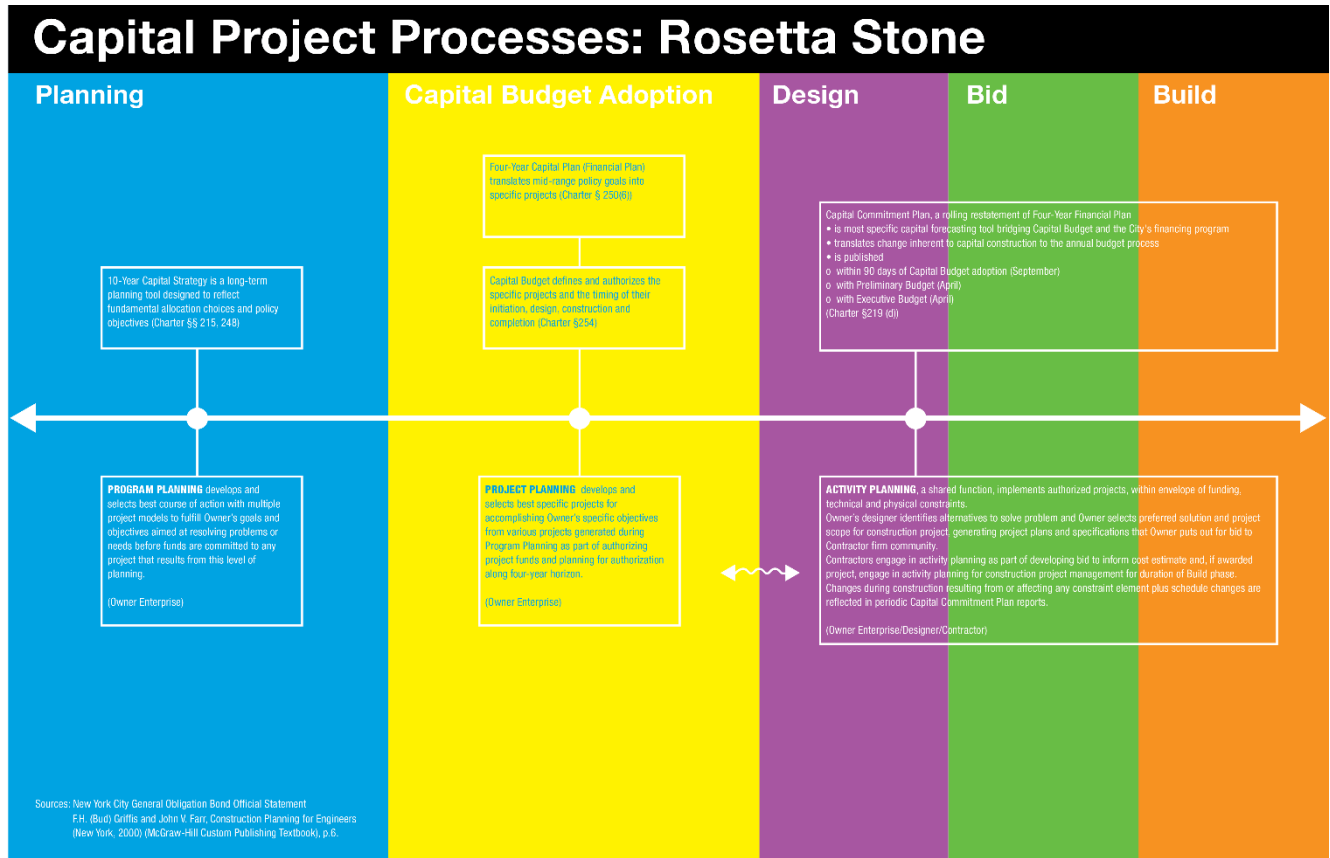
The Systemic Construction Data Analytics working group that formed after this event has partnered with Columbia/DSI's "Data for Good" program to begin the process of working with a City-wide data set from the City's Capital Project Dashboard with projects greater than \$25 million from 2013. This student project will apply the methodology used in the earlier student-led data analytic projects, and we hope the resulting analysis will begin to identify systemic drivers of cost growth and schedule delay for all city construction projects so that, with additional data and analysis, we can identify systemic improvements to practice and policy, especially at the system-wide level.

On Improving Project Service Delivery. Town+Gown began its focus on capital project delivery as an exercise in nomenclature to separate "procurement" and "contracting" from "project service delivery."

In the built environment and, in particular, public capital construction, words like *procurement* and *contracting* can obscure relations to other large system processes and, in particular, to the underlying functions they facilitate. In large organizations, by obscuring the project service delivery function, words with roots in the larger enterprise system can create conceptual impediments that inhibit management innovation. The tendency of referring to *project delivery* as *procurement* and/or *contracting*, as those at public owners are accustomed to do, can obscure thinking of ways to improve *service delivery*. It is as if the words themselves inhibit innovative thinking.⁵

⁵ https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/SYMPOSIUM_MAY_2013.pdf, p. 1.

In 2012-2013, *Service Delivery Not Procurement*⁶ focused on service delivery methodologies from the local government perspective, while, in 2014-2015, *Service Delivery Not Procurement—At the State Law Level*,⁷ focused on service delivery methodologies from the State-level statutory perspective.



Capital Project Processes: Design-Bid-Build



⁶ See https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/SYMPOSIA_MAY_2013.pdf.

⁷ See https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/11.12.14_precis.pdf.

Assuming that modernizing service delivery methodology law at the State level would take time to accomplish, and, further, that, even with other available project service delivery methodologies, owners would continue to use traditional Design-Bid-Build (DBB) methodology for a significant portion of their public capital project portfolio, in November 2016, *Approximating Integrated Project Delivery in a Design-Bid-Build Environment: Innovations in Design and Construction*, focused on ways to approximate integrated project delivery (IPD) principles within the DBB environment.⁸ Panelists discussed the public construction contract in the context of transaction cost economics; innovations to approximate IPD in a DBB world; lean theory and techniques in practice; and building informational modeling (BIM) in action. Prior to this event, Town+Gown had explored BIM in two separate events.⁹

To bring the journey up to date, in May 2019, Town+Gown held a two-day event last May, *Construction+Finance: 2019*, which used the State's initial effort to modernize public service delivery methodologies as the occasion to explicitly link and focus, in a multi-disciplinary manner, on construction (service delivery methodologies) and finance together.

“New York’s mid-20th century ensemble of public construction laws constrains the vast majority of its public owners with 21st century capital programs . . . [and] the State’s organic set of laws under which public capital programs at all levels of government in the State are conceived, financed, constructed and maintained during and beyond their useful lives, are not only archaic, but have steadfastly resisted modernization.”¹⁰ One root cause is the “divide between public finance law and public construction law that goes beyond the different titles in the McKinney’s volumes and the use of terms such as ‘public works’ and ‘public improvement’.”¹¹ Both sets of laws “responded to different historical concerns, and evolved differently over time, though both are integral to public capital programs” . . . [which] require an set of integrated finance and construction laws for the most efficient and effective use of resources.”¹² “These outdated laws . . . limit the ability of public sector owners to avoid costs with modern service delivery techniques and tools, some of which are also financing techniques and tools.”¹³

⁸ See <https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/111716-precis.pdf>.

⁹ See *BIMfest* at https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/01_23_13_Precis.pdf and *BIMapalooza* at https://www1.nyc.gov/assets/ddc/downloads/town-and-gown/11.12.13_Precis.pdf.

¹⁰ Terri Matthews, “Blueprint for Modernizing Built Environment Law: A View from the Budget”, *Albany Government Law Review*, Vol. 6, Issue 1 (2013), p. 149.

¹¹ *Ibid.*, p. 154.

¹² *Idem*, citing Jean-Etienne de Bettignies and Thomas Ross, “The Economics of Public-Private Partnerships”, 30 *Canadian Public Policy*, Vol. 30 (2004), p. 135, and New York City Bar Association, Construction Law Committee, *21st Century Construction, 20th Century Construction Law*, February 2008 (<http://www.nycbar.org/pdf/report/ConstructionLaw.pdf>) (hereafter referred to as “2008 Report”), p. 4.

¹³ *Idem*, citing the 2008 Report, pp. 12-13, 16. Entire quote from *Precis for Construction+Finance in 2019*, May 29-30, 2019, p. 16; not yet posted to Town+Gown website

Capital Project Processes: Finance

Sources of Funds

Tax-exempt and taxable bond proceeds to reimburse General Fund for cash expenditures on capital projects

- New York City General Obligation (GO) Bonds
- New York City Transitional Finance Authority (TFA) Future Tax Secured Bonds
- New York City Water Municipal Water Finance Authority (Water Authority) Bonds

Federal grant program funds

State subsidies and grant program funds

General Fund expense funds for project items deemed not "capital eligible" or for "pay-as-you-go" expenditures for projects deemed "capital eligible"



Uses of Funds

City Agency as Operational Owner	Project type(s)
Department of Citywide Administrative Services	City-owned office buildings City-operated court facilities
Department of Corrections	Jail and correctional facilities
Department of Cultural Affairs	City-owned and non-City-owned cultural facilities
Department of Environmental Protection	Water and sewer distribution system Water resources systems including dams, reservoirs and water treatment facilities Waste water treatment facilities, including holding tanks and green infrastructure Ancillary operations facilities
Fire Department	Fire houses and ancillary operations facilities
Department of Health and Mental Hygiene	Health clinic facilities
Department of Homeless Services	City-owned homeless shelters
Library Systems—Brooklyn, Manhattan and Queens	City-owned and non-City-owned library facilities
Department of Parks and Recreation	Parks and recreational facilities Ancillary operations facilities
Police Department	Police precincts and ancillary operations facilities
Department of Transportation	Streets, arterial highways and bridges Ferry terminals and ferries Ancillary operations facilities

Today's event uses State legislation adopted last summer that authorizes broad design-build (DB) authority to the City's construction agencies as the occasion to bring forward these two strands of research and focus on issues of data and culture in project service delivery.¹⁴

Culture in Construction. There are various lenses through which to view construction. The management lens focuses on project planning, which consists of the "systematic identification of program and project tasks, task schedules and resources required for task accomplishment" and is embedded into all phases of a capital project.¹⁵ The management of any public project has at least two aspects—the owner's and the constructor's. Though the two aspects relate to each other, they are different in important respects and they may overlap at certain times during a project's lifecycle.

The relationships among the owner of construction and the firms within the *constructor network of firms*, is based on contracts. The constructor is actually a network of firms—

¹⁴ Assembly 7636-B and Senate 062934, which awaits final approval by the Governor.

¹⁵ F.H. (Bud) Griffis and John V. Farr, *Construction Planning for Engineers*, (New York, 2000) (McGraw-Hill Custom Publishing Textbook), p. 5.

typically referred to as a prime contractor and its subcontractors—that all relate to each other by a series of contracts, much like the contract between the owner and the prime contractor. This contract-created network has the characteristics of a *quasi-firm*.¹⁶ These related contracts for a project are closely connected to each other throughout the construction process, and while the owner and the constructor are not in opposition to each other, they have different perspectives on the many functions they share, such as project management.

The quasi-firm network *via* contractual relations stands in contrast to the earlier “master builder” paradigm in construction, which was characterized by “teams of artisans in full-time employment [who] generally moved from one project to the next using technologies that were well understood.”¹⁷ Cultural cohesion in the master builder paradigm was easier to achieve than under the current paradigm of “[t]ransactional interaction based on lowest cost,” characterized by “changes in team composition” and “cultural fragmentation” within each quasi-firm on a project where “[r]elationships are often tense and untrusting as a result of the contracts upon which they are based.”¹⁸ It is difficult for project teams to “create a new set of relationships each time a project is formed [and] the demand for social management skills has increased, but this need often remains unfulfilled.”¹⁹

Viewing the complex setting of a construction project through the lens of production function reveals a “parade of trades” montage where the project is an assembled object, fixed-in-place where “the stations—or work crews—move through the emerging whole [building or infrastructure in the process of becoming]”.²⁰ This “parade of trades” process on a vertical building project (and to a lesser extent on a horizontal infrastructure project) also “involves a large number of specialty trades that generally work in a continuing and repeating sequence as they move from one floor to another, from the structural parade, the overhead work parade, the perimeter work parade, the enclosure work parade to the interior finishes work parade, which can impact access and create congestion.”²¹ The concentration of work at the site will vary by trade and “the different parades [will] move through a building in different

¹⁶ See Robert R. Eccles, “The Quasifirm in the Construction Industry,” *Journal of Economic Behavior and Organization*, Vol. 2 (1981), pp. 335-357.

¹⁷ R. Thomas, Marton Marosszkey, Khalid Karim, S. Davis and D. McGeorge, *The Importance of Project Culture in Achieving Quality Outcomes in Construction* from Proceedings IGLC-10, August 2002, Gramado, Brazil p. 2. See <https://pdfs.semanticscholar.org/e9af/bce575fcaff9f4070b21ca44a480f7d62d8b.pdf>, accessed 11-01-19 @ 11:53 a.m.

¹⁸ *Idem*

¹⁹ *Idem*

²⁰ Ballard and Howell, *op. cit.*, pp. 2, 4.

²¹ Iris Tommelein, David Riley, Greg Howell, “Parade Game: Impact of Workforce Variability on Trade Performance”, *Journal of Construction Engineering and Management*, Sept/Oct 1999, p. 304.

directions.”²² In this setting, “[e]very project is somebody else’s subproject” in an atmosphere of “fast completion in a dynamic setting where frequent changes are not the exception but the rule.”²³ While the construction industry stands out among all other industries across various aspects, in part, because construction is less like factory production and more like product development conducted at a specific site requiring on site assembly against this complex “parade of trades” montage,²⁴ the construction industry’s adaptation of Toyota’s total quality management theory and practice as “lean” construction principles can expose commonalities between construction and all other industries when looking at construction..²⁵

Analysis of 13 Australian projects, “comparing the organisational culture of each project with overall quality outcomes” used the “Competing Values Framework” (the “Quinn model”) to assess the nature of the organization’s culture.²⁶ The Competing Values Framework has four culture profiles consisting of Clan Culture, Adhocracy Culture, Hierarchy Culture and Market Culture.²⁷ This analysis “found that projects achieving below average performance showed a strong orientation towards *market* forms of culture, which are paradoxically, results orientated.” The management style [in the *market* forms of culture] are ‘hard-driving’ and competitive, [focusing] on the individual and his/her ability to produce [and] are not conducive to develop co-operative, open, team environments, but rather, adversarial, conflict-ridden projects concerned with individual, or organisational, self-preservation.”²⁸ The projects achieving “above average result exhibited considerably weaker Market characteristics while possessing strong traits associated with Clan types of organisations [which] place a premium on team cohesion, consensus and morale and are led by managers with a [people oriented] mentor or facilitator style.” These firms “recognised and were receptive to the needs of the individual and the team as a whole, [an] approach to managing projects . . . most likely to nurture and environment conducive of proactive, committed, and open team working.”²⁹

Thus, “[p]roject quality, a consequence of much more than just management systems and procedures, [depends on] cultural cohesion within these organizations.”³⁰ The current

²² *Ibid.*, p. 305.

²³ Sven Bertelsen, “Lean Construction: Where Are We and How to Proceed?”, *Lean Construction Journal*, Vol. 1 October 2004, p. 56.

²⁴ Glenn Ballard and Greg Howell, “What Kind of Production Is Construction?”, *Proceedings IGLC '98 Guaruja, Brazil*, pp. 2, 4, 6. See also, Ophir Rozenfeld, Rafael Sacks, Yeheil Rosenfeld and Hadassa Baum, “Construction Job Safety Analysis”, *Safety Science*, 48 (2010), p. 491.

²⁵ Sweet and Schnier, *op. cit.*, pp. 381-382. See also Thomas, *op. cit.*, pp. 7-10.

²⁶ Thomas, *op. cit.*, p. 10.

²⁷ *Idem*, citing to K. Cameron and C. K. Barnett, *Organizational Quality as a Cultural Variable: The Quality Movement and Organizational Theory* (Sage Publications Inc. 2000), pp. 271-294.

²⁸ *Idem*

²⁹ *Ibid.*, p. 11.

³⁰ *Idem*

paradigm's "[f]ragmentation and specialization within the supply chain [creates] a myopic focus on cost and short-term goal attainment, [replacing] openness, trust, respect and the development of long-term relationships, all of which are essential for strong cultures that are able to provide the broad range of quality outcomes that are required of a successful project."³¹

A recent study, also using the Quinn model, focused on "the relationship between organizational traits such as culture and delay in construction" and compared projects completed in the United States and in India.³² The study found "that 'clan' culture dominates in construction companies located in the U.S.", when compared to construction companies in India, which are dominated by a "market culture."³³ The "clan" culture in construction companies is "also consistent with the national culture of the U.S.", as measured in a prior study" that noted that "in the U.S. culture, hierarchy is established for convenience."³⁴ Organizations with a "clan" culture are those "held together by loyalty"[and they attach] great importance to teamwork, participation and consensus" and measure success by "[s]ensitivity to customers and concern for people"³⁵ The study indicated "that American construction companies experienced less delay in their projects than Indian construction companies did" with "74% of American construction companies [completing] their projects with less than 5% delay, while this percentage was 35% for Indian construction companies."³⁶ Thus, "construction companies' organizational culture is part of the delay equation," which also includes other factors that are "contractor-related (e.g., rework due to errors), owner-related (e.g., change orders), consultant-related (e.g., lack of experience of consultant in construction projects), labor-related (e.g., absenteeism), design-related (e.g., design errors, material-related (e.g., late delivery of materials), equipment-related (e.g., equipment breakdowns), . . . project-related (e.g., complex projects) [and external-factor-related] (e.g., natural disasters)."³⁷ Sixty percent of responding U.S. companies, however, reported that "50% or more of the delays were caused by the owner."³⁸

Transaction Cost Economics and Culture. From the transaction cost economics (TCE) lens, inefficiencies in the construction process, particularly during the *build* phase, conducted *via* the linked set of contracts that creates an *ad hoc* quasi-firm for each projecting can be assessed on

³¹ Thomas, *op. cit.*, p. 2.

³² David Arditi, Shruti Nayak and Atilla Damci, "Effect of Organizational Culture on Delay in Construction", *International Journal of Project Management*, 35 (2017) pp. 137, 140.

³³ *Ibid.*, p. 141.

³⁴ *Idem*, citing to G. Hofstede, G.J. Hofstede and M. Minkov, *Culture and Organizations: Software of the Mind: Intercultural Cooperation and its Importance for Survival* (McGraw Hill, 2010).

³⁵ *Idem*

³⁶ *Ibid.*, p. 142.

³⁷ *Ibid.*, p. 145.

³⁸ *Ibid.*, p. 142.

the basis of how well the contracts resolve information asymmetries on the project “before the deal is struck, or *ex ante*, and after the deal is struck, or *ex post*” within a shared environment of uncertainty.³⁹ TCE draws upon economic, organizational and legal theories and analytical tools to describe economic actors and economic activity in a way that is consonant with the actual experience of most actors involved in the activity.⁴⁰ Since TCE is based, in part, on organizational theory, TCE analysis can also account for cultural norms embedded in the contracts between and among the quasi-firm members.

The TCE paradigm uses the contract as the lens through which to view economic activity.⁴¹ TCE is an interdisciplinary branch of economics that, combined with relational contracting theory, provides a framework to conceptualize the efficiency of construction contracts in the face of the tendency for construction contracts, especially those for public projects, to assume they are complete because they have anticipated all future events and have negotiated price accordingly when that assumption becomes noticeably untenable because empirical observations on the ground reveal that project participants view actual projects as distinct from what the contract drafters wrote. Construction participants “. . . negotiate these issues *ex ante* based on *ex ante* information and related information asymmetries; and . . . work within an incomplete contractual framework to negotiate within the *ex post* environment, where a totality of change—on the ground, within the external environment, and between the parties themselves, exacerbated by changing related information asymmetries—requires functional *ex post* negotiation to reflect such modifications.”⁴² TCE provides a richer set of analytical tools for government, as an owner of construction and as a policy maker in the construction field. The TCE paradigm can help unify the fragmented nature of construction-related analyses as well as provide a way of moving beyond the application of orthodox economic analysis to shed light on the industry in ways that would be helpful for project contracts and policy formation.⁴³

The practices and issues within the construction environment align with TEC’s underlying assumptions. The financial planning for and the design and construction of long-lived physical

³⁹ Terri Matthews, “Blueprint for Modernizing Built Environment Law: A View from the Budget”, *Albany Government Law Review*, Vol. 6, Issue 1 (2013), p. 162, citing de Bettignies and Ross, *op. cit.*, p. 137; and Patrick Bajari and Steven Tadelis, “Incentives versus Transaction Costs: A Theory of Procurement Contracts”, *RAND Journal of Economics*, Vol. 32, No. 3, Autumn 2001, pp. 387-407, p. 388.

⁴⁰ Oliver E. Williamson, “Examining economic organization through the lens of contract,” *Industrial and Corporate Change*, Vol. 12, No. 4 (12/4 ICC Association), p. 920.

⁴¹ Oliver Williamson, *Revisiting Legal Realism: The Law, Economics and Organization Perspective* (Oxford University Press, 1996), p. 393; Williamson, Examining, *op. cit.*, p. 925.

⁴² Matthews, *op. cit.*, pp. 162-163; citing to Oliver E. Williamson, *The Theory of the Firm as Governance Structure: From Choice to Contract*, 16 *Journal of Economic Perspectives* 171 (2002), p. 174; see also Ian R. Macneil, *Contracts: Adjustment of Long-Term Economic Relations Under Classical, Neoclassical, and Relational Contract Law*, 72 *Northwestern University Law Review*, 854 (1978).

⁴³ Williamson, Examining, *op. cit.*, pp. 921-922 (Footnote 4).

assets involve sets of relationships in a shifting environment of unequal information and imperfect understanding. The construction milieu is the poster child for asymmetric information—"a situation where two parties to a transaction involving a good or service have unequal knowledge of the properties or risks involved in making that transaction."⁴⁴ A critical objective for the owner is increasing the chances of aligning its interests in budget, schedule, safety and quality with those of its agents—the designer and constructor quasi-firm—in construction, and the contract is the vehicle (and written record) by which the owner negotiates with the parties to align interests of principal and agent in an environment of asymmetric information.⁴⁵

The transaction or unit of economic activity at the focus of TCE has a degree of asset specificity that reduces the ability to redeploy resources, is subject to unanticipated disturbances, and must happen at sufficient frequently for participants to care about reputation in the market and create incentives for participants to incur expenses to participate.⁴⁶ These aspects have an impact on the governance framework established in the contract. "As asset specificity builds up, bilateral dependency sets in and, in combination with uncertainty (which pushes incomplete contracts out of alignment), the aforementioned contractual complications appear."⁴⁷ Construction projects are specific assets as an economic matter, and they have to be among the most idiosyncratic of assets due to the realities of building a particular thing on a particular site. Unanticipated disturbances practically define the construction environment. Moreover, in the construction setting, asset specificity exists at the beginning of the relationship, unlike the industrial setting where asset specificity develops. Construction projects occur frequently enough, especially in a fragmented construction market where there is a close relation between the business cycle and the construction cycle, so that reputation likely matters and there is likely a benefit from incurring the expenses of participating.

In TCE, "organization both matters and is susceptible to analysis."⁴⁸ TCE's view of actual human actors and their behavior more closely reflects human reality than orthodox economic theory, permitting focus on adaptation, changes in process over time and choice among organizational form in response to change.⁴⁹ TCE assumes human actors are rational within the bounds of their individual capacities, are self-interested and have the capacity to look ahead.⁵⁰ This

⁴⁴ Danny Myers, *Construction Economics: A New Approach* (London: Spon Press 2004), pp. 149-150, 251. See also Joseph Stiglitz, "Principal and Agent, *The New Palgrave: A Dictionary of Economics*, Vol. 3 (London: Macmillan, 1987), pp. 966-71.

⁴⁵ Myers, *op. cit.*, pp. 149-150, 251. See also Stiglitz, *op. cit.*

⁴⁶ Williamson, Examining, *op. cit.*, p. 923.

⁴⁷ *Idem*

⁴⁸ *Ibid.*, pp. 922, 938.

⁴⁹ *Ibid.*, p. 938.

⁵⁰ *Idem*

version of the human actor comports more accurately reflects actors in construction than the perfectly rational man in orthodox economics. The economic consequence of bounded rationality is that "all complex contracts are unavoidably incomplete"; the economic consequence of self-interest is "opportunism, on which account parties to a long-term contract will contemplate defection from the spirit of the contract and revert to self-interested bargaining when a contract is pushed out of alignment by significant disturbances."⁵¹ The economic consequence of foresight is that, looking ahead, "parties to a contract will "uncover salient hazards, ascertain the mechanism through which they work, and fold these back into the *ex ante* design of governance".⁵²

TCE, also focuses on inter-temporal transformations or changes over time that occur within the contract party organization or changes over time that occur between the parties.⁵³ Changes between the parties occur as a result of the 'bilateral dependency' that develops during an asset specific transaction. TCE focuses on operational adaptation by economic actors to the market at two levels. The first level of adaptation is the standard economic and apparently spontaneous adaption of the firm, as a black box, to price changes. The second level of adaptation, owing to its partial foundation in organizational theory, occurs within the hierarchy of the firm as is a "coordinated adaptation" within the organization "accomplished not spontaneously but in a 'conscious, deliberate, purposeful' way" that focuses on information beyond mere price.⁵⁴

Since DBB became the standard service delivery methodology in the middle of the last century, construction market participants have adapted, creating an evolving menu of service delivery methodologies that responds to changes in the various construction markets as well as changes in materials, building and information technology. Management theory related to construction has also changed over time. Further, despite the presence of large construction firms, the construction industry is by and large still dominated by small firms. The variance in organization form among the architect, engineering and contractor firms is matched by the variance in organization form on the owner side, especially when both public and private owners are included in the analysis.

TCE also focuses on governance, the nature of governance structures and the alignment of modes of governance with transactions as they relate to organizational adaptation to change

⁵¹ William Ibbs; Long D. Nguyen; and Seulkee Lee, Quantified Impacts of Project Change, Journal of Professional Issues in Engineering Education and Practice, American Society of [Civil] Engineers, January 2007, p. 46

⁵² Williamson, Examining, *op. cit.*, pp. 921-922

⁵³ *Ibid.*, p. 923-924.

⁵⁴ *Ibid.*, pp. 924-925.

under contracts that are incomplete—contracts that cannot provide for every possible event.⁵⁵ Few construction contracts happen without *many* contracts drafted and negotiated by *many* lawyers, whose practice is often to revise their contracts based on the results of litigation on projects gone wrong—theirs and others. Revising contracts, looking in the rear-view mirror, to mitigate possible future events of a similar nature is not, however, conducive to relationships on new projects with new goals and different parties. Contracts are more than simply protection from litigation or positioning for litigation. "Thinking contractually", the work of TCE, requires:

- viewing the "firm as a governance structure (an organizational construction)" not "a black box (a technological construction)"
- focusing on "the efficient alignment of transactions with modes of governance"
- interpreting "contractual and organizational variety principally in economizing terms".⁵⁶

TCE's focus on *ex post* governance issues in a transaction for which the contract is incomplete leads to legal analyses of how the framework of a particular contract reflects and/or is well suited to the capacities of the organizations that are parties to it and permits such organizations to respond to changes unanticipated by the contract without a party walking away from a dispute and/or resorting to litigation to resolve the dispute.⁵⁷ "The object is to discover delayed or indirect consequences, to which organizational theory is often attentive, thereafter to work out the ramifications for dealing more knowledgeably and effectively with phenomena in question by folding these delayed or indirect effects back in."⁵⁸ Instead of the orthodox economic approach that forces a calculation in an *ex ante* manner⁵⁹, TCE assumes incomplete contracting in which "[t]he object of farsighted contracting is to look ahead, recognize potential hazards, and use *ex post* governance (as well as *ex ante* incentive alignment) to reduce hazards and avoid regrets."⁶⁰ TCE also permits the component analysis to "... examine each legal issue through the lens of comparative, farsighted contracting."⁶¹

Design-Build Authorization and Culture at Public Owner Enterprises. Last summer, the State Legislature authorized broad DB authority to the City and its construction agencies. Compared to the DBB methodology, "[t]he principal advantage of DB . . . is speed. One entity replaces different entities who design and build with inevitable delay caused by using two entities whose

⁵⁵ *Ibid.*, pp. 925-928.

⁵⁶ *Ibid.*, p. 938.

⁵⁷ *Ibid.*, p. 386.

⁵⁸ *Ibid.*, p. 413.

⁵⁹ *Idem*

⁶⁰ *Idem*

⁶¹ *Ibid.*, p. 414.

work intersects. Those who design and build frequently do repetitive work and acquire specialized expertise.”⁶² A weakness of DB, however, is the idea that the “absence of an independent design professional selected by the owner can deprive the owner of the widest opportunities for good design.”⁶³ The design professional in DBB performs functions during the *build* phase and there has been concern with respect to DB that “[a]n unsophisticated owner [may lack] the skill to determine whether the contractor is doing the job well or as promised, ... [resulting] not only in substandard work but also in excessive payments being made early in the project or in slow payment or nonpayment of subcontractors.”⁶⁴ Since DBB contracts typically are fixed price contracts with the price determined at contract award, the DB methodology exposes a tension between the fixed price contract and the cost-plus contract. Owners typically prefer fixed price, but for a DB project, “the owner may not even know what is to be built when it enters into contract.”⁶⁵ Contractors, prefer cost-plus for a DB project because it “cannot know with any certainty what it will be expected to build; design may be completed after contract signed.”⁶⁶ Mechanisms to solve this tension include the owner’s preparation of “a set of performance specifications . . . [that at the very least can] “prescribe intelligent criteria for performance in advance” . . . [and the preparation of] a budget for each phase of the work . . . [designating] the budget estimate as a target price. If the actual cost is greater or less than the estimate, the contract price can be adjusted.”⁶⁷ For DB projects, “it may be useful for each party to agree on an independent certifier for progress payments.”⁶⁸

The transformation of public owner enterprises, well-versed in the management of projects under DBB, to the DB environment represents a culture change not unlike that experienced by governmental enterprises during executive transitions.⁶⁹ The operational side of government is critical for policy sea-changes, and “[s]uccessful transformation depends on the ‘infrastructure’ of the transformation—leadership, communication and capabilities.”⁷⁰ Culture underlies leadership, communications and capabilities so that organizational transformation requires cultural transformation within public owner enterprise entities and “[t]ransition offers crucial opportunities for shaping culture.”⁷¹ “[C]ulture comprises the values and norms, often implicit,

⁶² Justin Sweet and Marc M. Schneider, *Legal Aspects of Architecture, Engineering and the Construction Process*, 9th ed. (Stamford CT: Centage, 2009), p. 378.

⁶³ *Idem*

⁶⁴ *Idem*

⁶⁵ *idem*

⁶⁶ *Ibid.*, p. 379.

⁶⁷ *Idem*

⁶⁸ *Idem*

⁶⁹ Alexander Shermansong, *The Power of Culture: Four Steps to Delivering Success during Government Transition* (Civic Consulting USA 2019).

⁷⁰ *Ibid.*, p. 5.

⁷¹ *Ibid.*, pp. 5-6.

that define how the work gets done,” [empowering] people to behave in certain ways when they perform their jobs and influences their overall performance.⁷² Within public owner enterprises, culture change can “inspire the workforce to strive for excellence, to innovate, to increase adaptability, and to drive the overall results in performance.”⁷³

The transition to a design-build environment requires cultural change because the design-bid-build culture—or “business as usual”—will not work in a design-build environment and a misalignment between design-build goals and the public owner enterprise’s organizational culture could “doom [the] new initiatives before they even get started”.⁷⁴ Moreover, when a crisis in the new design-build environment “arises, as inevitably they do, teams without a strong culture rarely respond as cohesively or as well, increasing the likelihood of public stumbles and disappointed expectations.”⁷⁵ From analysis of several state gubernatorial transitions, four principles “leverage the power of culture change”, which are applicable to transition to a design-build environment, emerged and consist of setting values early, embedding culture into every process, modeling the culture personally and keeping at it by continuously evaluating and improving.⁷⁶ To set values early, organization leadership should define values “through self-reflection and conversations with staff” with creation of visual tools at the beginning of the transformation and using them to support communication.⁷⁷ Embedding culture into every process includes offering training within the organization, monitoring the change in culture and considering the new cultural values in recruitment and hiring.⁷⁸ Modelling the culture personally means including these values in all staff interactions, from orientation to performance review.⁷⁹ Continuously evaluating and improving the new culture to support design-build might include informal tools such as town halls and formal tools such as surveys and training, sharing results.⁸⁰

⁷² *Ibid.*, p. 6.

⁷³ *Idem*; citing to J.P. Kotter and J. L. Heskett, *Corporate Culture and Performance* (New York: Free Press 1992) and C. Dewar and R. Doucette, “Culture: 4 Keys to Why It Matters”, McKinsey & Company, March 2018.

⁷⁴ *Ibid.*, p. 7.

⁷⁵ *Idem*

⁷⁶ *Idem*

⁷⁷ *Idem*

⁷⁸ *Idem*

⁷⁹ *Idem*

⁸⁰ *Idem*