大成 DENTONS

Pierre Lortie
Senior Business Advisor

D +1 514 878 8863
pierre.lortie@dentons.com

Dentons Canada LLP
1 Place Ville-Marie, Suite 3900
Montréal, QC, Canada H3B 4M7

T +1 514 878 8800
F +1 514 866 2241

MEMORANDUM

To James Gray

From Pierre Lortie

Date July 10, 2019

Subject The delivery of public transit rail projects

Jim,

I was delighted for the opportunity to renew our acquaintance last Friday in Calgary. I really enjoyed our conversation and I fully agree that the record of on-time, on budget delivery of public transportation projects is dismal. Unfortunately, too many executives in the private and public sector think that they are so smart that this will not happen to them. History teaches that hubris is a very bad counsel. As shown in Appendix A, large-scale projects have a disastrous history of cost overruns.

A perspective on Mega-Projects completion performance

In-depth analysis of large-scale and complex public and private projects shows that they are highly problematic, with a poor performance record in terms of costs and real-time to completion.

– One of the most comprehensive studies covers 258 transportation projects ($90 billion worth) in 20 countries. Nearly all (90%) suffered cost overruns with an average overspend of 28%. The analysis shows the average rail project costing 45% more than projected and the average highway project 20% more.

– A study of about 3500 projects drawn from all over the world in several industries, revealed that cost overruns are the norm, being typically between 40 and 200 percent.

– Using a large pool of completed, comparable transportation infrastructure projects under the responsibility of the U.K. Department of Transport, the probability distributions for costs overruns for projects similar in scope and risks was established. The results are shown in Table 1.

Table 1: Inaccuracy in cost forecasts for rail, bridges, tunnels and roads

Type of project	Average inaccuracy (%)	Standard deviation
Rail	44.7	38.4
Bridges and tunnels	33.8	62.4
Road	20.4	29.9

(construction costs, constant prices)
Source : Flyvbjerg database on large-scale infrastructure projects

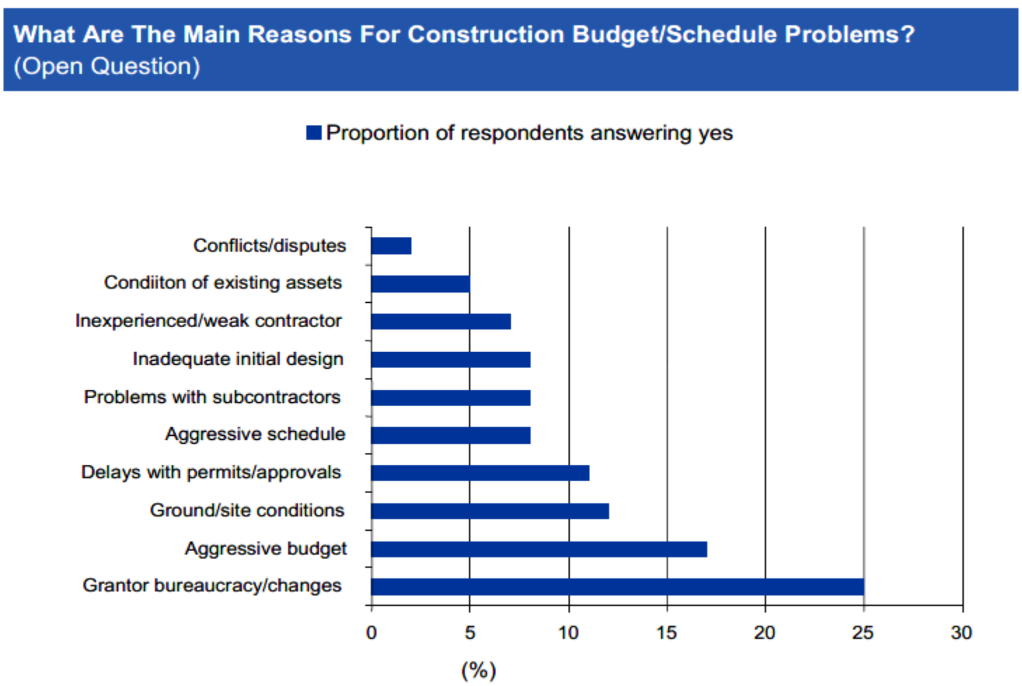
Two major conclusions relevant to the proposed Calgary mass transit project emerge from the substantial body of evidence regarding the design and construction of large-scale complex engineering and construction projects.

First, although expert know-how, skills and experience in project management supported by best-in-class methodologies and systems are necessary, they do not ensure that mega-projects will be completed in time and within budget. Even though the Big Dig (Boston) was managed by Bechtel and Parsons Brinckerhoff, two of the most experienced project management firms in the United States, this has not prevented the cost of the project to explode from $3.2 billion at inception to $14.8 billion at completion. More recently, saddle by delays, the Chevron Gordon LNG export facility in Australia has seen its cost swell from $37 billion to over $54 billion!

Second, forecasts of cost (and time to completion) of planned projects have remained constantly and remarkably inaccurate for decades. For the 70-year period for which cost data of rail, bridges, tunnels and roads are available, accuracy in cost forecasts has not improved. The empirical evidence leads to the inescapable conclusion that no improvement in forecasting accuracy seems to have taken place, despite all claims of improved forecasting models, better data, etc.

Standard & Poor's Risk Assessment

According to Standard & Poor's, the main reasons for delays and cost overruns are the following:



S&P observations concerning the main reasons are worthy of note:

Aggressive Scheduling

Tight works programing with aggressive milestones, delivery, or long-stop dates, is highlighted in a number of survey responses as a key reason for construction-phase distress. Respondents were wary of aggressive scheduling on projects where site access is constrained (limited to certain times of the day or months of the year) or restricted by, for example, weather or tidal conditions – absent relief from contractual performance. Politically-driven (or sensitive) timescales with little contingency or "float" are a particular concern among those surveyed.

> *Aggressive Budgeting*
>
> *Given competitive tendering, it is perhaps unsurprising that so many survey respondents identified aggressive budgeting as a key reason for construction-phase distress. Comments about insufficient liquidity, reserves, and contingency funds; and an inability to absorb (sometimes relatively minor) cost overruns were frequently noted in the survey responses.*
>
> *A number of respondents point to the fact that the public sector remains fixated with lowest price, and that – given affordability pressures – it takes a strong, sophisticated, and politically courageous grantor to identify and eliminate potentially winning bids that have been strategically underpriced.*

When I took over Bombardier Transportation as President, I had to deal with projects that had "gone really bad" and make sure that we did not go "haywire" with new transportation projects (i.e. integrated mass transit and rail projects and equipment) on a go-forward basis.

The history of megaprojects shows that their delivery is a high-risk, stochastic activity, with overexposure to so-called "black swans"; i.e., extreme events with massively negative outcomes. Executives and project managers tend to ignore this, treating projects as if they exist largely in a deterministic world of cause, effect, and control. The studies show that such complexity and unplanned events are generally unaccounted for, leaving budget and time contingencies inadequate. So, how does one "organize" to deliver on-time/on budget large infrastructure projects that is inherently a high-risk, stochastic activity?

We found that the most knowledgeable and supportive team was at University of Strathclyde, Glasgow, Scotland. At the time, the leader was Colin Eden, Director of the Graduate School of Business at Strathclyde. Currently Colin is Emeritus Professor of Management Science at Strathclyde Business School. The current Dean is Professor David Hillier. Although it has been a long time since I last spoke to Colin, I would surmise that it may be a good investment of time to contact him to discuss how he could – or some of his colleagues - contribute to your effort.

References

I believe the following documents may be of interest to you:

- Canada Line Final Project Report (https://www.partnershipsbc.ca/files-4/documents/Canada-Line-Final-Project-Report_12April2006.pdf)
- Fitch Ratings: Rating Criteria for Infrastructure and Project Finance (https://www.fitchratings.com/site/re/10038532)
- Standard & Poor's: The Anatomy of Construction Risk: Lessons From A millennium of PPP Experience (http://www.robbain.com/The%20Anatomy%20Of%20Construction%20Risk.pdf)
- Delay and Disruption Complex Projects (see attachment)

I would be happy to continue our conversation on this crucial public policy issue, should you deem it useful.

Best regards,

Pierre

APPENDIX A

Large-scale projects have a calamitous history of cost overrun[1]	
Project	**Cost Overrun (%)**
Suez Canal, Egypt	1,900
Scottish Parliament Building, Scotland	1,600
Sydney Opera House, Australia	1,400
Montreal Summer Olympics, Canada	1,300
Concorde supersonic aeroplane, UK, France	1,100
Troy and Greenfield railroad, USA	900
Excalibur Smart Projectile, USA, Sweden	650
Canadian Firearms Registry, Canada	590
Lake Placid Winter Olympics, USA	560
Medicare transaction system, USA	560
National Health Service IT system, UK	550
Bank of Norway headquarters, Norway	440
Furka base tunnel, Switzerland	300
Verrazano Narrow bridge, USA	280
Boston's Big Dig artery/tunnel project, USA	220
Denver international airport, USA	200
Panama canal, Panama	200
Minneapolis Hiawatha light rail line, USA	190
Humber bridge, UK	180
Dublin Port tunnel, Ireland	160
Montreal metro Laval extension, Canada	160
Copenhagen metro, Denmark	150
Boston-New York-Washington railway, USA	130
Great Belt rail tunnel, Denmark	120
London Limehouse road tunnel, UK	110
Brooklyn bridge, USA	100
Shinkansen Joetsu high-speed rail line, Japan	100
Channel tunnel, UK, France	80
Karlsruhe-Bretten light rail, Germany	80
London Jubilee Line extension, UK	80
Bangkok metro, Thailand	70
Mexico City metroline, Mexico	60
High-speed Rail Line South, The Netherlands	60
Great Belt east bridge, Denmark	50

[1] Source : Project Management Journal, April/May 2014