Case Study:
Costing and due diligence of large IT projects

Azfar Ali Khan, IFSD @ uOttawa
Case Study

Cost estimation – national wireless communications network
National Wireless Communications Case Study

- The Parliamentary Standing Committee on Finance has asked the Parliamentary Budget Office to review the reasonableness of the RCMP’s cost estimate to build a national wireless communications network starting with British Columbia and then moving on to other jurisdictions.
Costing techniques

- Cost-Relationship Estimation: Using a comparables model approach to estimation
  - Identify jurisdictions that are the most comparable
  - Data is consistently defined and categorized
  - Normalize using the cost driver most closely correlated with Total Cost

- Bottom-Up Engineering Estimate: Detailed breakdown into lower-level components each of which is costed separately for direct labor, direct material and other costs.
3-step costing methodology

1. Define parameters/working assumptions
2. Acquire data
3. Sort/analyze data
1. Define parameters/work assumptions

a. What are you costing? Why?
b. Does a current figure exist (e.g. from government)?
c. Do you have access to the data necessary to undertake the project?
d. Have comparable jurisdictions undertaken a similar project? If so, what was their cost?
What is a National Communications Network?

- From a communications network perspective, it is a wireless network used exclusively by emergency services for public safety purposes.

- From an organizational perspective, it is an information technology enabled collaborative, inter-organizational system.
Public Safety Communications Network

- Fire Fighting
- Command & Control Management (Dispatchers)
- Additional Towers Supporting MNR Fire Fighting & Parks
- Parks
- Ministries – Environment; Transportation; Natural Resources; Revenue; Community, Safety & Correctional Services
- Adult Corrections Youth Facilities
- Transport Vehicles
- Radio Network Towers
- Central Ambulance, multiple Communications Centers
- Helicopters
- Ambulance Bases
- 2 Emergency Health Vehicles
- 1 Hospitals
- Boats
- Policing Vehicles Detachments
- Maintenance vehicles Patrol Yards
- Policing Vehicles
- Detachments
- Patrol Yards
Key Considerations

- Propogation of the wireless signal is key
  - Geographically to cover the terrain of the jurisdiction
  - In-building coverage for large metropolitan cities

- What percentage of the jurisdiction needs to be covered?
Benchmarking

- Once you understand the scope of what is to be costed ask yourself “is this a unique policy problem?”

- Benchmarking data is far superior to planned data in assessing reasonableness of cost estimates
2. Acquiring data

- Alternative data sources (e.g. comparative jurisdictions)
- Where to go when other jurisdictions are unwilling to share (e.g. World Bank, OECD)?
- Data credibility is CRUCIAL:
  - What is a credible source of data?
  - How can data be verified?
  - The importance of multiple data sources/data points.
Identify the Right Targets

• What are the ideal jurisdictions for comparative purposes?

• Research/consult to identify the key factors that determine the scale, scope and cost of the network
  • Talk to subject matter experts

• Which jurisdictions “look like us the most”? 
What are the major elements to be procured?

a. Tower sites
b. Network Operations Centre
c. Radio dispatch centres
d. End-user devices
Exercise #1

1. What jurisdictions would you target for benchmarking that are closest to British Columbia’s planned network? Which data points or characteristics did you deem most important in identifying these targets?

2. What strategies would you employ to elicit participation in the survey?

3. What advantages and disadvantages do you see in employing the comparable model?
Key Learnings – Exercise #1

Identifying and Ranking the Targets

- A similar sized jurisdiction
  - The size, population and number of public safety end users would likely have a similar design and cost for the network

- A jurisdiction with a comparable population density
  - Jurisdictions with comparable urban-rural split would likely have a similar design and cost for the network

- Similar geography and topography
  - Jurisdictions that also have hills, mountains, valleys would likely have a similar design and cost for the network (propagation of the wireless signal is a key factor in determining the number of towers needed to cover the jurisdiction)

It’s like looking in the mirror!
Key Learnings - How to elicit sharing of data

• Respect people’s time
• Research and be explicit about what data you are looking for
• Two-way street of knowledge exchange
• No attribution, unless approval explicitly given
• Practice your elevator pitch
• Network, network, network!

Sell, sell, sell, soft skills matter!
Key Learnings – Exercise #1

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses statistical cost estimating relationships</td>
<td>Very contingent on the quality and comparability of the data in order to have a reliable cost estimation</td>
</tr>
<tr>
<td>Builds a network of subject matter experts that you can tap into on an ongoing basis. Particularly if you deliver value to them as well!</td>
<td>Would not be as accurate as a bottom-up engineering estimate</td>
</tr>
<tr>
<td>Inexpensive</td>
<td></td>
</tr>
</tbody>
</table>
3. Sorting and analyzing data

- What are common cost drivers?
- What are the phases of your project (i.e. design, build, operate)?
- Break-down and understand your costs
Exercise #2

1. Determine the appropriate lifecycle for the analysis

2. Determine the best cost driver in order to estimate the Total Cost, which includes both Capital and Operating Costs

3. Prepare a sensitivity analysis to provide a range of estimates on the normalized Total Cost of the survey jurisdictions
Key Learnings – Exercise #2

1. Calculating the appropriate lifecycle for the analysis
   - Simply take the average of the lifecycles from the twelve jurisdictions. The answer is 15.17. Therefore, 15 years is the appropriate lifecycle.

2. Determine the best cost driver for Total Cost
   - First calculate Total Cost by multiplying the Annual Operating & Maintenance Cost by the 15 year lifecycle and add to Capital Cost. Use the CORREL statistical formula in Excel to calculate the Correlations with Network Users, Towers and End-User Devices. Towers has the highest correlation score and is the best cost driver.
Key Learnings – Exercise #2

3. Include a sensitivity analysis to provide a range of cost estimates

- Normalize the Total Cost by dividing the British Columbia towers by the number of towers for each jurisdiction – this will give you the normalizing ratio. Multiply the normalizing ratio by that jurisdiction’s Total Cost to arrive at the Normalized Total Cost for each jurisdiction. We can remove the high-end and low-end outliers ($1.372B on the high-end and $119M and $154M on the low-end). This provides cost estimates ranging from $395M to $1.056B with the majority of the jurisdictions falling in the $600M to $900M range. Therefore, the Government’s cost estimate does not appear reasonable as its estimated Total Cost of $1.750B is significantly higher than those of the peer jurisdictions.
Key Learnings – Exercise #2

• Our experience is that basic statistical techniques that can be done in Microsoft Excel are all that are needed for cost estimation analysis.

• The key challenge is acquiring good quality data.
The takeaway

The five key due diligence questions
The five due diligence questions…

1. Can you clearly identify the problem that you are solving?
2. Has any other jurisdiction faced this problem? How did they address it?
3. Do you understand the current and future states?
4. Do you have a plan to realize benefits and manage risks and the experienced team to implement it?
5. Do you have a performance measurement framework to capture inputs, outputs and outcomes (and to report transparently)