What happens when the project budget is too small?

• And the government is trying to balance its budget?
• “National Defence is confident the program will deliver what the navy needs, and a spokeswoman noted that the navy planners are currently engaged in a "design-to-cost" analysis.”
• “Overall, the main criteria will be to optimize the combat capability within the design to cost framework.”
Objectives

• In this presentation:
  – we discuss the history and methodology of design-to-cost
  – we dispute the notion that design-to-cost can serve as a panacea for all projects
  – we present conditions for the successful implementation of a design-to-cost approach
  – we discuss the implications for DND and cost estimators

Obvious question: Why DTC and not CAIV?

• We don’t know for sure, but we have two hypotheses:
  1. Colour of Money Problem (i.e., Votes)
     The source of funds for the acquisition differs from that of the operations and maintenance. Therefore, focus of the program office is on completing the acquisition.
  2. Meaning vs. Buzzwords
     Perhaps cynical, but it is easier to say that we are using design-to-cost than admitting that we are cutting capabilities.
What is DTC?

- According to the *Design to Cost Handbook* (DoD 1990):
  - “managerial technique for controlling cost by “designing to specific goals.””
  - intended to encourage creativity in the design process
  - DTC is a way of doing business, not another tool for the tool box
- What is happening at DND is a cost-cutting activity, not true DTC

Is design to cost more cost efficient than other techniques?

Not necessarily...

![Figure 1. Total Program Cost Growth—DTC vs. Non-DTC](chart.png)
Why did so many DTC programs fail to see cost benefits?

• According to Kausal (1996) DoD overused the technique
• Looking at the use of DTC in the early days:
  • Applied to all major programs
  • Became part of contracting process (bureaucratic) rather than design oriented
  • Impossible to negotiate realistic targets on sole-source contracts
  • No central guidelines → reinvented the wheel with each program
  • Most contractors didn’t have DTC processes

So, when has DTC been successful?

**Project controls: Cost/schedule/progress management of the NASA Wind Tunnel restoration project**
Yu, Kelvin
*Cost Engineering: Apr 1996; 38, 4; ProQuest Central*

**Aerospace Construction Cost Estimating**
Brown, Joseph A
*American Association of Cost Engineers. Transactions of the American Association of Cost Engineers; 1992; 2,*
ProQuest Central

**An Aerospace Component Cost Modelling Study for Value Driven Design**
J.M.W Cheung, J.P Scanlan, S.S Wiseall
*CIRP IPS2 Conference 2009*

**A case study on TATA NANO**
Vikas Minhas

**Saving an Estimated $1.2 Billion with a Design-to-Cost Methodology**
Raytheon Systems
What do these successes have in common?

<table>
<thead>
<tr>
<th>Project</th>
<th>For profit enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA</td>
<td></td>
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<tr>
<td>Rolls Royce</td>
<td>✓</td>
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<td>TATA</td>
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<td>Raytheon</td>
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<tr>
<td>Loral Electronic Systems</td>
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</tbody>
</table>

Is DTC the cure for the department’s project woes?

- There are two barriers to implementing DTC at DND:
  - Government processes
  - Budget allocation practices
The system that exists makes it tricky to implement DTC

**Policy agenda**
- Existing programs
  - All government
- New initiatives
  - Government centre
  - Operating departments

**Executive process (Cabinet, TB, Finance)**
- Treasury Board submissions
- Memorandum to Cabinet
- Budget funding
- Finance Minister
- Prime Minister

**Legislative process (Parliament)**
- Estimates/Supply
- Budget implementation acts
At the department level…

MC’s have to be approved before project approval by Treasury Board

So when should the department get their MC approved?
You can change the sides so long as the shape remains a triangle

Key messages
You can’t change one without the others
- e.g. Increasing scope requires augmenting the budget
- Some combinations are impossible
  - e.g. Designing a car in 15 minutes
  - e.g. Building a frigate for $1M
Summary in three questions

1. What is design-to-cost (DTC)?
   - A way of doing business

2. When should we apply this approach?
   - From the very beginning

3. Is this the cure for the department’s project woes?
   - Probably not.

Implications

• Objective: to avoid “sausage making”

• Ideally: Cost estimators must be engaged earlier in the approval process

• Realistically: Need to create simple models, tests of reasonableness that can be used by policy wonks
THANK YOU