Presenting about Operations Research – 10 Tips for OR Talks

SA475B Operations Research for the Military, Business and Society

0. Credits and disclaimers

- These are some collected "dos and don'ts" through observation and experience
- This talk was heavily inspired by articles written by Matt Might[1] and Jeff Kline[2]
- There are many ways of giving a good talk

[1] `http://matt.might.net/articles/academic-presentation-tips/`

[2] Owl speaks lion, *ORMS Today*, August 2016

1. Know your audience

- Find out who you're speaking to, and aim appropriately
- A presentation to a senior executive with no OR background is different from a talk to a room of OR academics
- Take your time with introductory material, even if it feels awkward or insulting (it's not)
- It's easy to gloss over concepts and details that took us months or years to learn

1. Know your audience

- No matter who your audience is, keep it professional
- Every talk is an opportunity for you to put your best foot forward
- Be mindful of the possible diverse backgrounds in your audience

2. Practice, practice, practice

- Practice is the key to a natural delivery
- Rehearse the presentation, don't memorize the talk
  - e.g. transitions between topics, intentional pauses
- Concentrate on your opening
  - First impressions are important
  - Good opening = comfort early on

2. Practice, practice, practice

- After rehearsing, ask yourself:
  - Was there a topic I spent too much time on?
  - Was there a topic I could have done without?
  - Did I explain each topic clearly and concisely?

  $\Rightarrow$ Expand, cut, or refine as necessary

3. A talk is about the big ideas

- Your talk should present the same ideas in your report, but on its own terms
- The ideal outline for a talk may be very different from how the report is organized
- Your talk should concentrate on the big ideas

4. The 40/30/30 rule

- First 40% of your talk:
  - Introduce and motivate your problem
  - Why is this problem important?
- Second 30% of your talk:
  - Give an overview of your approach and results
  - What is novel about your approach?
  - Why are your results interesting, important, etc.?
- Last 30% of your talk (or for Q+A):
  - For the experts: mathematical and computational details, etc.
  - Blow the audience away with your technical prowess

5. Slides should not overwhelm the viewer

- Too much information on a slide $\Rightarrow$ brain shuts off
- Present information piecemeal
  e.g. bullet-by-bullet, node-by-node, equation-by-equation
- Highlight important parts
  (but use sparingly)
- Spread information among multiple slides if necessary
- Do not cut and paste from your paper

Don't do this

Theorem

Computing the least core value of scheduling games is NP-hard.

Proof.

By the previous theorem, the least core value of scheduling games is

$$z^* = \frac{1}{2} \max_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(N) - v(S) - v(N \setminus S)\} = \frac{1}{2} v(N) - \frac{1}{2} \min_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(S) + v(N \setminus S)\}.$$

Note that the minimization problem above is equivalent to the problem of minimizing the sum of weighted completion times of jobs in N, with weight w_j and processing time p_j for each job $j \in N$, on two identical parallel machines. Sahni (1976) showed that this two-machine problem is NP-hard, even when $w_j = p_j$ for all jobs $j \in N$. □

Do this

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$$= \frac{1}{2} v(N) - \frac{1}{2} \underbrace{\min_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(S) + v(N \setminus S)\}}_{P2||\sum w_j C_j}$$

$\Rightarrow$ Problem is equivalent to $P2||\sum w_j C_j$, which is NP-complete. [Sahni (1976)]

6. A picture is worth a 1000 words

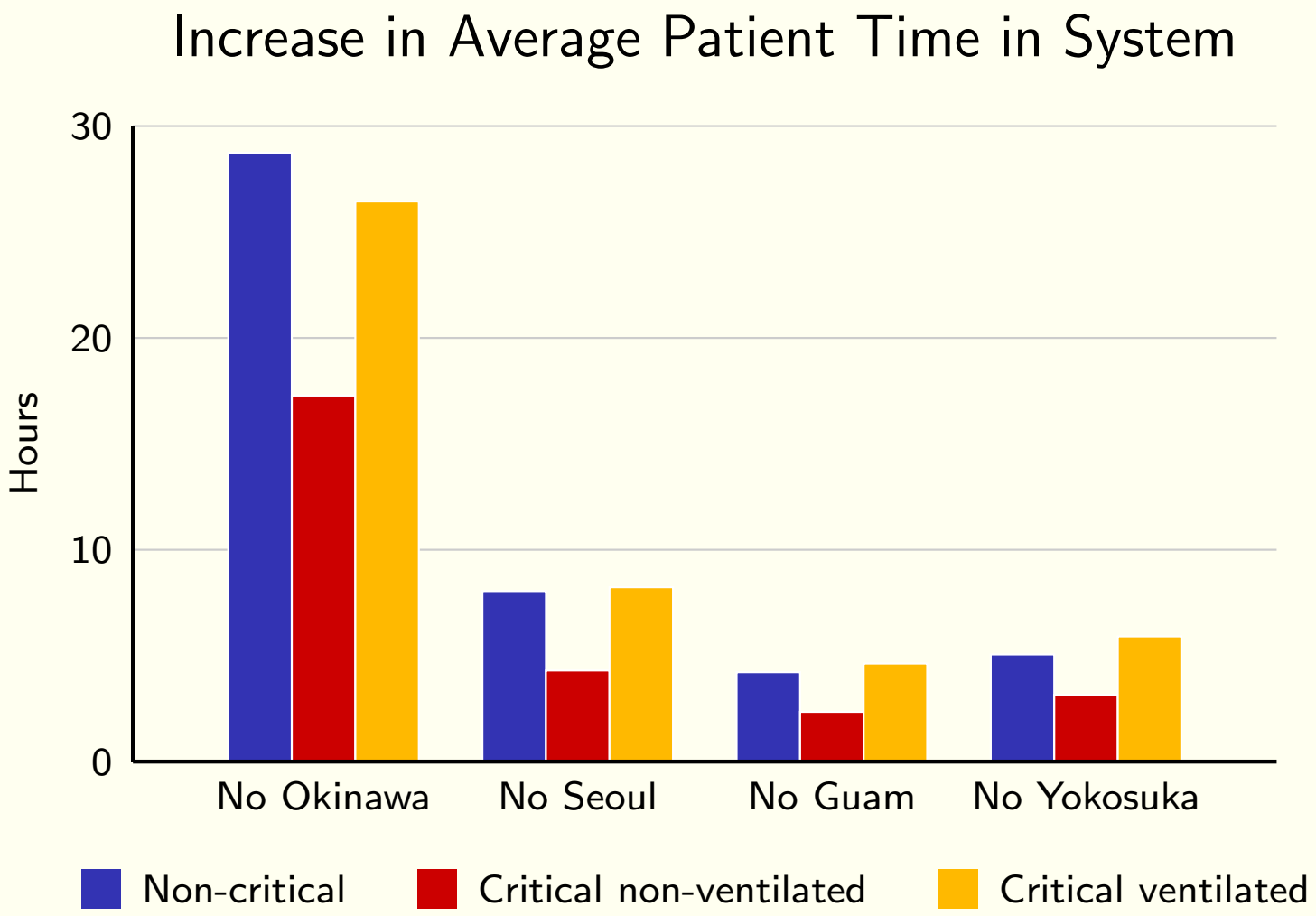
- Images and animations can convey or illustrate an idea better than text
- If you can use an image instead of text, do it
  - This takes thought and time
- Avoid unnecessary details on images

Avoid this

Average Patient Time in System

	Non-critical	Critical non-ventilated	Critical ventilated
Base	54.15	27.93	42.46
No Okinawa	82.89	45.21	68.90
No Seoul	62.20	32.23	50.69
No Guam	58.37	30.28	47.09
No Yokosuka	59.21	31.08	48.97

Try this instead



7. Use math carefully

- Math as a language is expressive and precise
- Talks are hand-wavy and should focus on intuition
- Reading lots of math disengages the reader from the speaker
- Be careful with how you use math
- Avoid unnecessary details
- Consider changing notation to make it easier to grasp

This is not a good way to present math

$$
\begin{aligned}
\text{minimize} \quad & C_{\max} \\
\text{subject to} \quad & C_{\max} \geq C_{mn} \\
& C_{00} \geq \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{0js} x_{0j0s} \\
& C_{ik} \geq C_{i-1,k} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks} && i = 1, \ldots, m;\ k \in \mathcal{J}, \\
& C_{ik} \geq C_{i,k-1} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks} && i \in \mathcal{M};\ k = 1, \ldots, n-1, \\
& S_{ij} - S_{hk} \leq M u_{hkij} - 1 && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& S_{hk} - S_{ij} + \sum_{l \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{hls} x_{hlks} \leq M v_{hkij} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& C_{ij} = S_{ij} + \sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{irjs} p_{irs} && i \in \mathcal{M}; j \in \mathcal{J}, \\
& u_{hkij} + v_{hkij} = 1 + y_{hkij} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& x_{hlks} + y_{hkij} \leq 1 + z_{hlksij} && i, h \in \mathcal{M}; j, k, l \in \mathcal{J}; s \in \mathcal{S}, \\
& \sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1 && i \in \mathcal{M}; j \in \mathcal{J}, \\
& \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1 && i \in \mathcal{M}; k \in \mathcal{J}, \\
& \sum_{s \in \mathcal{S}} x_{ijks} = \sum_{s \in \mathcal{S}} x_{hjks} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& \sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{irs} x_{irjs} + \sum_{h \in \mathcal{M}, h \neq i} \sum_{l \in \mathcal{J}} \sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{hls} z_{hlksij} \leq Q_{\max} && i \in \mathcal{M}; j \in \mathcal{J}, \\
& x_{ijks}, u_{hkij}, v_{hkij}, y_{hkij}, z_{hlksij} \in \{0, 1\} && i, h \in \mathcal{M}; j, l, k \in \mathcal{J}; s \in \mathcal{S}.
\end{aligned}
$$

This is a better way to present math

- Overall mathematical program

minimize	$C_{\max}$
subject to	permutation flow shop constraints
	concurrent job constraints
	peak power consumption $\leq Q_{\max}$
	variable-type constraints (nonnegativity, binary)

Subsequent slides: one slide per constraint type

8. Style matters

- Your talk is primarily about what you say, but...
- Your slides should be visually appealing
  - Clean fonts
  - Lack of gratuitous adornments
  - Balance of whitespace
  - Imagery and animations that enhance your message
- Learn to use your presentation software well

9. Questions are not random

- Anticipate questions your audience might ask
- Some answers belong in your talk
- Some don't, but you can reserve a separate slide
- For unanticipated questions, buy time by reformulating the question in your own words
- If an exchange becomes long or hostile, thank the questioner and suggest taking the discussion offline

10. Speak slowly and use your body

- You are probably talking too fast
  - Rule of thumb: at least 1 minute per slide
- Be aware of your body language
  - Stand up straight
  - Gesture with your whole body

10. Speak slowly and use your body

- Look at your projected slides, look at your audience, don't look at the the computer
- Step away from the podium, walk around
- Invest in a good presentation remote

To summarize...

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2. Practice, practice, practice
3. A talk is about the big ideas
4. The 40/30/30 rule
5. Slides should not overwhelm the viewer
6. A picture is worth a 1000 words
7. Use math sparingly
8. Style matters
9. Questions are not random
10. Speak slowly and use your body