

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 Might¹ and Jeff Kline²
- There are **many** ways of giving a good talk

¹<http://matt.might.net/articles/academic-presentation-tips/>

²Owl 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 that there might be different 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?
- ⇒ 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 way to present an idea for a talk may be very different from how you've written your report
- 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 data, models, 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 $j \in N$. \square

Do this

Theorem

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

Proof.

$$\begin{aligned} z^* &= \frac{1}{2} \max_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(N) - v(S) - v(N \setminus S)\} \\ &= \frac{1}{2} v(N) - \underbrace{\frac{1}{2} \min_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(S) + v(N \setminus S)\}}_{\text{P2} \mid \mid \sum w_j C_j} \end{aligned}$$

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



6. A picture is worth a 1000 words

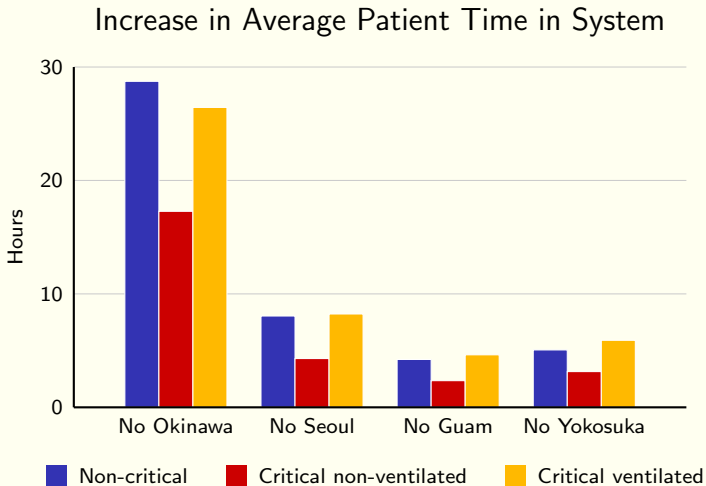
- Images and animations can convey or illustrate an idea better than text
- If you can use an image instead of text, do it
 - This takes thought and time
- Avoid unnecessary details on images

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

minimize C_{\max}

subject to $C_{\max} \geq C_{mn}$

$$C_{00} \geq \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{0js} x_{0j0s}$$

$$C_{ik} \geq C_{i-1,k} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks}$$

$$i = 1, \dots, m; \quad k \in \mathcal{J},$$

$$C_{ik} \geq C_{i,k-1} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks}$$

$$i \in \mathcal{M}; \quad k = 1, \dots, n-1,$$

$$S_{ij} - S_{hk} \leq M u_{hkij} - 1$$

$$i, h \in \mathcal{M}; j, k \in \mathcal{J},$$

$$S_{hk} - S_{ij} + \sum_{l \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{hls} x_{hlks} \leq M v_{hkij}$$

$$i, h \in \mathcal{M}; j, k \in \mathcal{J},$$

$$C_{ij} = S_{ij} + \sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{irjs} p_{irs}$$

$$i \in \mathcal{M}; j \in \mathcal{J},$$

$$u_{hkij} + v_{hkij} = 1 + y_{hkij}$$

$$i, h \in \mathcal{M}; j, k \in \mathcal{J},$$

$$x_{hlks} + y_{hkij} \leq 1 + z_{hlksij}$$

$$i, h \in \mathcal{M}; j, k, l \in \mathcal{J}; s \in \mathcal{S},$$

$$\sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1$$

$$i \in \mathcal{M}; j \in \mathcal{J},$$

$$\sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1$$

$$i \in \mathcal{M}; k \in \mathcal{J},$$

$$\sum_{s \in \mathcal{S}} x_{ijks} = \sum_{s \in \mathcal{S}} x_{hjks}$$

$$i, h \in \mathcal{M}; j, k \in \mathcal{J},$$

$$\sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{irs} x_{irjs} + \sum_{h \in \mathcal{M}, h \neq i} \sum_{l \in \mathcal{J}} \sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{hls} z_{hlksij} \leq Q_{\max}$$

$$i \in \mathcal{M}; j \in \mathcal{J},$$

$$x_{ijks}, u_{hkij}, v_{hkij}, y_{hkij}, z_{hlksij} \in \{0, 1\}$$

$$i, h \in \mathcal{M}; j, l, k \in \mathcal{J}; s \in \mathcal{S}.$$

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...

1. Know your audience
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