UGBA 141
Discussion 13

Agenda: Final Exam Review II

See also Discussion 12 (Final Exam Review I) & Lecture 23 (Final Flash Review)

April 29, 2022
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Reminder

- HW4, HW5, Practice final solutions are available for pick up at front desk

- Please kindly complete the **course evaluation** at *https://course-evaluations.berkeley.edu/* by Sunday 11:59PM if you haven't already. We would really appreciate your feedback! 🙏

- **Final Office Hours** (All Virtual *https://bit.ly/ugba141sp22*)
  - Monday 5/2, 2-3PM with Park
  - Tuesday 5/3, 1-2PM with Hansheng
  - Wednesday 5/4, 4-5PM with Park
  - Friday 5/6, 2-3PM with Hansheng
  - Saturday 5/7, 10-11PM with Park
  - Sunday 5/8, 6-8PM with Hansheng
  - Utilize our Discord server for Q&A!

Final Information 5/11 3-6pm

32 Q's (35 pts): mix of quantitative and qualitative, integrative topics

- **SCM** bullwhip effect, quick response (Obermeyer), contracts
- **Queue** Little's law, waiting time, throughput losses, pooling, psychology
- **Strategy** revenue management, product management (IDEO)
- **Emerging** transparency (Tessei), knowledge sharing (Danone), e-commerce (Amazon), network effects, future of work (Google)
- **Integrative** process analysis, newsvendor, risk pooling
- **Skip** quality, EOQ/QR/PT, sustainability, cases before Tessei

One cheat sheet of an 8.5" x 11" paper + basic calculator
(Key formulas and tables of standard normal CDF/Inventory/Loss/Erlang will be provided)

Wednesday: Final Flash Review + **Friday:** Final Review #2 by GSI

Practice: lectures, discussions, HWs, practice exam, optional textbooks

SCM: Knowledge Map

	Bullwhip Effects	Quick Response	Contracts
Concepts & Takeways	Information distortion; Reactive and overactive ordering; Trade promotions; Shortage gaming; Amplification of variability;	Made-to-stock vs made-to-order; Speculative vs reactive capacity; Quantify + reduce + avoid + hedge against uncertainty;	Buy-back contracts; Buy-back profit; Optimal buy-back price; Vertical integration; Double marginalization;
Cases	-	Sport Obermeyer	-
Question Practiced	Practice final Q20, Q31, Q32; Final flash review 0.07; Final flash review Strategy 0.09;	HW4 Q1-4; DIS9 Q1-5; Practice final Q21-23, Q30; Final flash review SCM 0.12, SCM 0.17;	HW4 Q5-8; DIS9 Q6-8; Practice final Q16-19; Final flash review SCM 0.09, SCM 0.15;
LEC Slides	SCM-II	SCM-III	SCM-III

Queue: Knowledge Map

	Little's law	Waiting Time	Loss Systems	Pooling & Psychology
Concepts & Takeaways	Average inventory (I) = average flow rate (R) * average flow time (T); Coefficients of variation; (Implied) utilization; Idle time;	Waiting time = time in queue; Time in system = time in queue + processing time; Special case Poisson/ Exponential; Number of people in queue/system	Probability that all resources are busy; Erlang loss table; Variability leads to waiting times although utilization < 1;	Parallel vs Pooled; Pooling reduces # waiting not # in service; Psychology of supplier and customer (interpretation and feeling); Economics of scale; Stability;
Question Practiced	HW5 Q1, Q2, Q5-7; DIS10 Q1-2; Practice final Q5-6, Q11, Q32; Final flash review Queue 0.07, Queue 0.12, Queue 0.15;	HW5 Q3, Q5-7; DIS11 Q1-4; Practice final Q7-10, Q12;	HW5 Q4; DIS 11 Q5-6; Practice final Q14-15; Final flash review Queue 0.17;	Practice final Q2, Q13, Q32; Final flash review Queue 0.09;
LEC Slides	Emerging-V, Queue-I	Queue-II	Queue-II	Queue-III

Practice Problem

Customers send e-mails to a help desk of an online retailer every 2 minutes, on average, and the standard deviation of the interarrival time is also 2 minutes. The online retailer has three employees answering e-mails. It takes on average 4 minutes to write a response e-mail. The standard deviation of the processing times is 2 minutes.

Q1. Estimate the average customer wait before being served.

Q2. How many e-mails would there be, on average, that have been submitted to the online retailer but not yet answered

Solution.

Emerging: Knowledge Map

	Transparency	Knowledge Sharing	E-Commerce	Network Effects	Future of Work
Concepts & Takeaways	Measures to improve transparency; Advantages and disadvantages for both customers and employees;	Codification vs personalization; Networking attitude; Knowledge management	Slow/fast-moving items; Operational capabilities; Centralized inventory + risk pooling;	Platform business models to leverage network effects; Value from 3 sources; One-sided vs multi-sided;	Automation (complementarity + new work); Gig economy; Value flexibility; Risk of disintermediation; Managing hybrid workforce; Worker turnover; Multihoming;
Cases	Tessei	Danone	Amazon	-	Google
Question Practiced	Practice final Q3; Final flash review Emerging 0.07, Emerging 0.09;	Final flash review Strategy 0.12;	Practice final Q28; Final flash review Emerging 0.15;	Practice final Q4; Final flash review Emerging 0.17;	Practice final Q1; Final flash review Emerging 0.12;
LEC Slides	Emerging-II	SCM-II	Emerging-IV	Emerging-V	Emerging-V

Strategy: Knowledge Map

	Revenue Management	Product Management
Concepts & Takeaways	(Optimal) protection levels; (Optimal) overbooking;	Design thinking = human-centered service design process; Process transparency; Customer transparency;
Cases	-	IDEO
Question Practiced	HW5 Q8-10; DIS 12 Q1-2, Q3-4; Practice final Q24-27, Q32; Final flash review Strategy 0.15, Strategy 0.17;	Practice final Q29; Final flash review Strategy 0.07;
LEC Slides	Strategy-I	Strategy-II

Some (Potentially Confusing) Concepts

- How busy is a server in a queueing system? **Utilization** versus **Throughput loss**
  - Utilization: what fraction of servers are busy on average
    - Definition: $\frac{p}{am}$
  - Throughput loss: probability that *all* servers are busy
    - Definition: $P_m(r), r = \frac{p}{a}$ (read Erlang loss table to find the value for given m and r

Some (Potentially Confusing) Concepts

- **Lost sales** versus **Leftover inventory**
  - Lost sales: demand is larger than inventory
  - Leftover inventory: inventory is larger than demand
  - Note: Inventory = order quantity when there is no initial inventory
  - Simple illustrative example: assume order quantity $=500$
    - When demand is 200, lost sales =0, leftover inventory =300
    - When demand is 600, lost sales =100, leftover inventory =0

- For **random** demand with Normal distribution
  - Expected lost sales = $\sigma L(z)$
  - Expected leftover inventory = $\sigma I(z)$
  - z is z-score, and $L(z), I(z)$ read from Standard Normal Inventory Loss Table

Some (Potentially Confusing) Concepts

- Critical ratio, z-score, service level
- Backward computation (in Newsvendor)
  1. Compute critical ratio $= \dfrac{G}{G+L}$
  2. Find z-score z based on critical ratio by reading standard normal table
  3. Compute optimal quantity $Q = \mu + z\sigma$
- Forward computation
  1. Q, μ, σ are given
  2. Compute z-score by normalizing Q, $z = \dfrac{Q-\mu}{\sigma}$
  3. Get service level (probability that $D \leq Q$) based on z by reading standard normal table

Thank you!