Database Management and Performance Tuning

Evaluation & Exam

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Unit 13

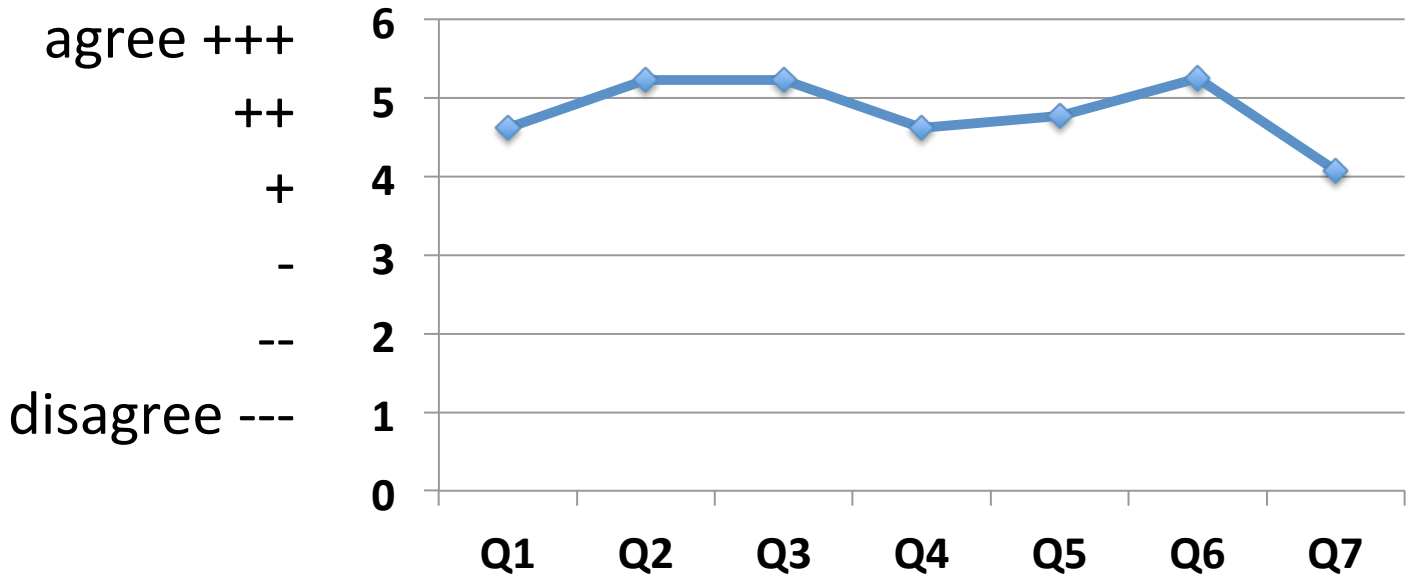
Acknowledgements: The slides are provided by Nikolaus Augsten and adapted from "Database Tuning" by Dennis Shasha and Philippe Bonnet.

Outline

Outline

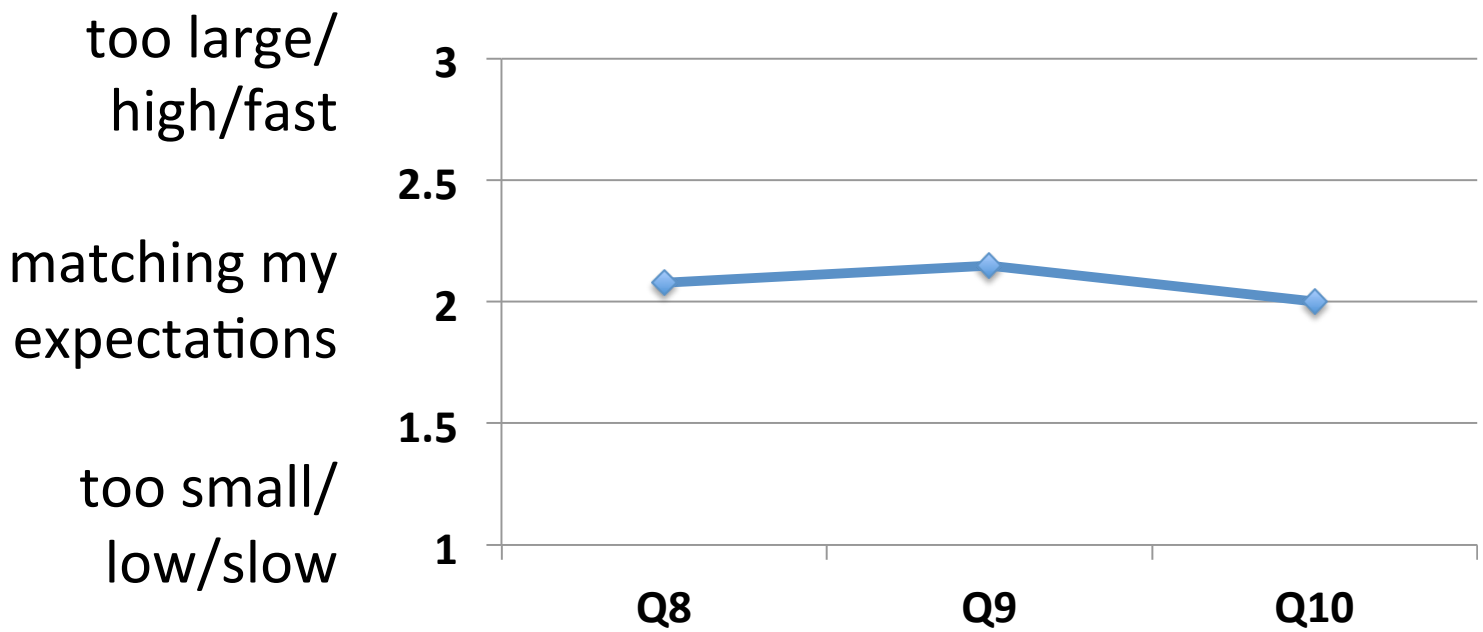
The Lecturer ...

- Q1: lectures the course actively and highly engaged.
- Q2: shows a professional preparation.
- Q3: structures the content clearly and structured.
- Q4: explains content coherently.
- Q5: offers valuable teaching material.
- Q6: interacts with students in an open, helpful, and friendly manner.
- Q7: motivates my active participation in the course.



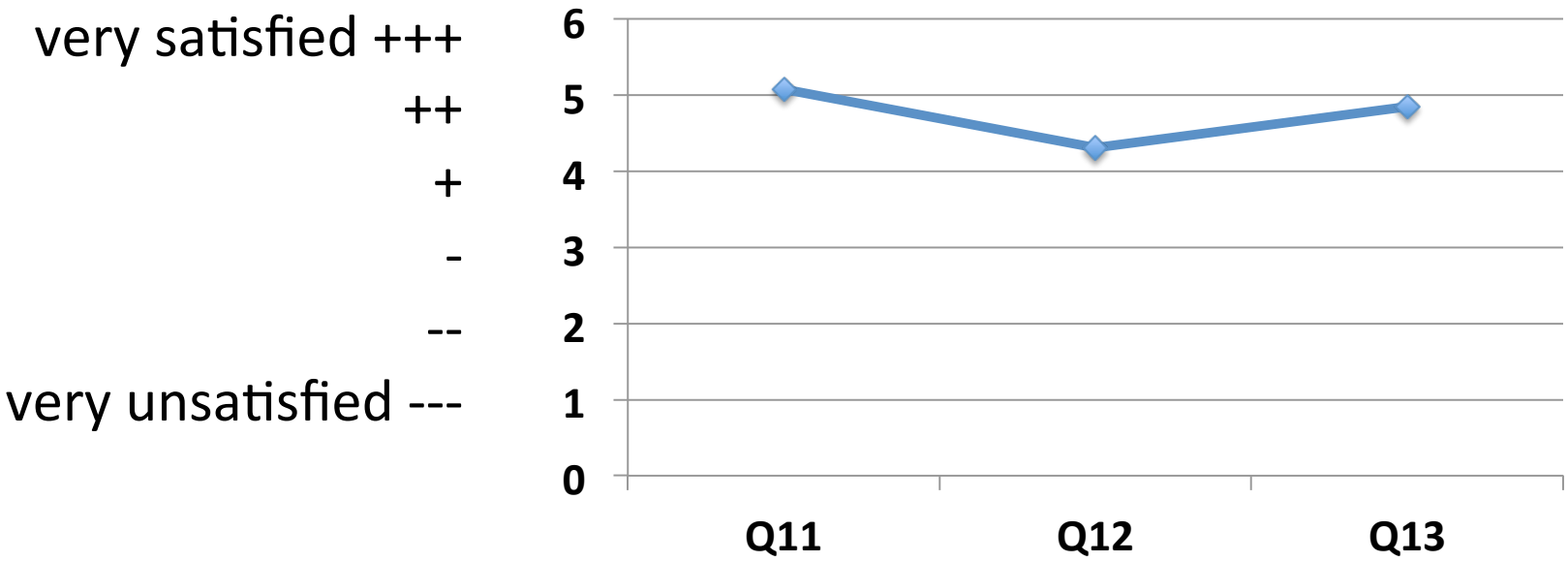
The Lecture ...

- Q8: covers a thematic area/field which is...?
- Q9: shows a level of difficulty and complexity which is...?
- Q10: is taught at a pace which is...?



Overall Rating

- Q11: My level of satisfaction with the teacher as a whole is...?
- Q12: My level of satisfaction with the exercises as whole is...?
- Q13: My level of satisfaction with the entire lecture as a whole is...?



What You Like

- Hands-on Experience with Database Systems
  - Having practical assignments every 2 weeks.
  - Teaching material has helped me improved performance of my startup project.
  - The lessons learnt in this course have valuable, piratical application to real-world problems.
  - Good thematic, good pace that things are taught, good examples brought by the lecturer.
  - It is highly practical, which is a nice alternative to the usual "theory-learning" lectures.
  - Things taught here are immediately applicable to own DB's and is easily understandable.
  - Most of the exercises are very helpful to understand the lecture content; they were a lot of fun to solve.
  - ...

What You Do Not Like

- Heavy Workload
  - Some exercises were too complex or required significant amount of hours to complete. This does not seem aligned with 3 ECTs. The course should award 4-6 ECTs.
  - Even though the exercise were good regarding the learning effort, the exercises took always too much time.
  - Exercise 4 took way too long for solving.
  - Some of the assignments were too long.
  - The exercises were sometimes too long.
- Doubts on Final Exam
  - All the grade is in one final exam.

Suggestions

- Improve presentation
  - ... Try to interact more with students during the lecture if applicable.
  - ... This course must be one of her first course ever that she has given / lectured.
  - Maybe slow down a little bit on the examples, as not everything is clear right away but requires some time to think through as a student.
  - The lecturer could be less nervous. She is doing a good job giving an inspiring and interesting lecture. So there is no reason to be nervous.
- Improve structure
  - Sometimes there can be much replication from the previous lecture.
  - Some hints for the assignments were given on the day of deadline, forcing me to revise my answers/redo the assignment at the last possible time. Giving the hints earlier would be better.
  - Sometimes, it was a bit hard to hear the main point of a statement. I would suggest pointing out more clearly what is the importance.

Outline

Exam

- January 14,15, 2.E.09
- Oral exam, around 30 minutes per student
- Relevant documents:
  - slides of lecture notes
  - "Database Tuning" by Dennis Shasha and Philippe Bonnet
- Relevant chapters in the book:
  - Chapters 1-3 (except 2.4)
  - Chapter 4.6
  - Appendix B.1–B.4
- Do the exercises in the book!

Types of Exam Questions

Theory question Example: Explain write-ahead logging and how the logging mechanism can be tuned.

- illustrate situation (database buffer, log buffer, log file, data files)
- use correct terminology and give precise definitions (e.g., what is a checkpoint?)
- structure your answer (how does WAL work? list tuning opportunities, then discuss each of them)
- discussion (advantage/disadvantage)
- be prepared for the questions "why?" and "what if?"

Types of Exam Questions

Questions with practical part Example: What is transaction chopping and how does it work? Show the algorithm on the following transactions: T_1: $R(a), R(b), W(b), R(e)$, T_2: $R(b), R(e)$, ...

- answer theory question
- give an overview of how you are going to solve the example
- before you execute a step in the solution, explain the step
- again, be prepared for the questions "why?" and "what if?"

Follow-up questions

- detailed questions on the same topic to test understanding
- relation to other topics

Outline

Summary

- What is database tuning?
- Five basic principles
  1. think globally; fix locally
  2. partitioning breaks bottlenecks
  3. start-up costs are high; running costs are low
  4. render on the server what is due on the server
  5. be prepared for trade-offs

Summary

- Query processing:
  - parsing
  - optimization
  - evaluation
- Query tuning:
  - reachability: minimizing `DISTINCTS`
  - rewriting of nested queries

Summary

- Index tuning
  - Query types
  - Dense vs. sparse index
  - Clustering vs. non-clustering index
  - B^+-tree vs. hash index
  - Composite indexes

Summary

- Lock tuning:
  - eliminate unnecessary locks
  - control granularity of locking
  - circumvent hot spots
  - Snapshot isolation
  - Transaction chopping

Summary

- Recovery Tuning
  - extra disk for log
  - WAL: group commits
  - WAL: optimizing `fsync()`
  - checkpoints: organizing writes to data file

What's next?

- Exam in January – good luck :-)