

NATIONAL UNIVERSITY OF SINGAPORE

School of Business

Department of Decision Sciences

DSC4215 Data Visualisation

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Curriculum for Data Visualisation and Actionable Intelligence

Successful data visualisation projects require a business problem, validated data, visualisation for initial insights, and statistical analysis for predictive insights. Through interactive learning, students discover how to get insights from real world data, answer strategic business questions, create an information strategy for supply chain, visualise and monetise big data.

Real data-sets from supply chain, retail, and social media are placed in cloud technology (Google). Students will use *Qlik*, a state-of-the-art Business Intelligence Software, to create amazing supply chain visualisations and learn about the critical elements required to make visualisation tell a convincing story. Students also learn about types of data available in a typical corporation, how this data may be collected, shortcomings in data and organisational culture issues that challenge the successful completion of projects.

To round out the course we review the ethical and legal considerations of acquiring and using certain types of data. We conclude with developing the next generation of business analytics using cross-industry data mashups. The skills learned are readily transferable across many industries and the core concepts are technology agnostic.

Learning Outcomes

Building on supply chain and analytics knowledge of prior courses, this course will enable students to:

- Develop a vision and mission for analytics actionable intelligence
- Define strategic business questions
- Visualise multi-department data and end-to-end value-chain
- Acquire data from internal and external sources
- Support Sales & Operations Planning with facts
- Discover innovative techniques for visualising data
- Identify business risks and opportunities found through visualisation
- Learn about data storytelling to provide insights on actions to be taken
- Aligning intelligence strategy with the corporate strategy of an FMCG or finance company

Skills in critical thinking and problem analyzing are developed through in-class discussion of case examples from multiple perspectives (demand planning, supply planning, data storytelling) and roles (e.g. supply planner, budget manager, user experience design, change manager). Emphasis is on practical and collaborative learning through 'lab' sessions, group seminars and group discussion.

Assessment

Class Participation	10%
Individual Assignments	40%
Midterm	20%
Final Group Project	30%

Final Group Project

Each project team is required to create a Lean Canvas and design a visualization tool that answers strategic business questions for their own designated users. The topic should be relevant to supply chain, retail and social media. Examples include supply and demand planning, inventory analysis, pricing strategy, plant locations, production scheduling, and throughput analysis. Final design of the project is a product of the project team's creativity, but must be able to allow users to get a clear picture of the current state they are in and what they should do to move forward. A good way to think of this would be:

- What is the current situation? (where are we today?)
- What needs to be changed? (how to win tomorrow?)
- What are the recommendations?
- What are the monetisable opportunities?
- What are supply chain opportunities?

Each team is recommended to source a business problem and obtain validated data for the project. Bonus marks will be provided for receiving data from external business partners/companies. For the project, students are required to deliver the following:

- Lean Canvas
- Visualization Tool
- Storyboard/Infographic
- Presentation

Examples of data visualisations that may be covered include:

- Supply and demand alignment
- Retail store performance
- Product cost/profit analysis
- Customer interactions on social media
- Budget and business activities

Required Text

Carter, K. B. (2014), *Actionable Intelligence: A Guide to Delivering Business Results with Big Data Fast!*, Wiley : New Jersey.

Course Outline

Week 1:

Lecture Topic: Overview of Data Visualisation and Actionable Intelligence

- Course Overview
 - *The session introduces the learning activities and techniques: “Learn, Dream, Make” - the new learning by doing; Supply Chain Project Example - Versafleet [<http://versafleet.co/features.html>];*
 - *Group discussion during which students can share experiences and perspectives; suggestions on different ways in to learning about the issues covered - from the perspective of demand planning, supply planning or data storytelling.*
 - *The session concludes with a check on shared understanding (learning objectives, how to actively read the materials provided in the reading list; Group-work ‘rules of engagement’;)*
- Setting the stage with an Earnings Call
- Creating an infographic for your introduction

Readings:

- Carter, K. B. (2014), *Actionable Intelligence*, Chapter 1
 - Estee Lauder Latest Earnings Call Transcript on SeekingAlpha.com
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Week 2:

Lecture Topic: Strategic Business Questions

- Review Infographics
- Come prepared to discuss earnings call and environment in more detail
- Business Discovery: understand the ways to prioritize questions and find answers.
- *This session opens with a brief review of shared learnings from the readings issued in (1) then takes students right into the ‘engine room’ of supply chain planning, exploring the demand and supply planning role.*

Reading and Prep:

- Actionable Intelligence: Chapter 2
- Start into Qlik Analyst Role

To do:

- Setup Qlik and Google Cloud
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Week 3:

Lecture Topic: Gathering and Managing Data

- Creating a Foundation of Data: Acquiring data, verifying accuracy, organizing it, sharing it safely
- Database fundamentals and why a database vs. Excel
- Relational Database vs. Graphing Database

Readings and Prep:

- Actionable Intelligence: Chapter 3
 - Install Neo-4j
 - Read about and Establish your Google Big Query database
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Week 4:

Lecture Topic: Visualization

- What should a good data visualization provide?
- Creating your business visualization

Readings and Prep:

- Actionable Intelligence: Chapter 4
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Week 5:

Lecture Topic: Lab Work

- Ensure technology is working and all are caught up
 - Review key capabilities and processes for success
 - Acquiring competitor and customer data
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Week 6:

Lecture Topic: Making the Business Case

- Governance that works for intelligence
- Lean Business Canvas
- Linking Supply Chain Improvements with Financial Results
 - EVA Model

Readings:

- Lean Canvas and Evaluating Supply Chain Benefits
 - Actionable Intelligence: Chapter 5, 6, 7, 8
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Week 7:

- **In-Class Midterm**
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Week 8:

Guest Speaker on Industry Trends

Week 9:

Lecture Topic: Project Overviews: Strategic Business Question

- Using the lean canvas for your project
- SWAT Application From Beginning to End
- Forward Looking KPIs

Readings and Prep

- Students are encouraged to study the roles of the users and sponsors of their project
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Week 10:

Lecture Topic: Midterm Review & Project Overview: Wrangling Data

- Students present their solutions and outline their business case to a 'panel' composed of their peers and moderated by the instructor
 - Continuing using the tools to deliver business results
 - Review of the group project and support
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Week 11:

Lecture Topic: Project Overview: Analyzing in many ways

- Pushing the envelope with new analysis and fitting the results into the visualizations
 - Managing Forecast Data
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Week 12:

Lecture Topic: Project Overview: Taking Action

- Did we win? And measuring results again using EVA and ROI
 - Wrap-up with key concepts review
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Week 13:

Lecture Topic: Final Project Presentations

Reading list

Bendoly, E. (2016), 'Fit, Bias, and Enacted Sensemaking in Data Visualization: Frameworks for Continuous Development in Operations and Supply Chain Management Analytics', *Journal of Business Logistics*, **37**, pp.6–17 [doi:10.1111/jbl.12113]

Cao, L. (2016), 'Data science and analytics: a new era', *International Journal of Data Science and Analytics*, **1**:1, pp.1-2 [doi:10.1007/s41060-016-0006-1]

Chen, H., Chiang, R.H. and Storey, V.C., (2012), 'Business Intelligence and Analytics: From Big Data to Big Impact', *MIS quarterly*, **36**:4, pp.1165-1188

Feki et al. (2016), 'Big Data Analytics-enabled Supply Chain Transformation: A Literature Review', IEEE Proceedings of the 49th Hawaii International Conference on System Sciences [doi:10.1109/HICSS.2016.142]. See also selected other papers in the 49th Hawaii International Conference on System Sciences [http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=7426593]

Fisher, D. et al. (2012), 'Interactions with Big Data Analytics', *ACM Interactions*, **19**:3, pp.50-59 [https://www.microsoft.com/en-us/research/publication/interactions-with-big-data-analytics/]

Khalifa, S. et al. (2016), 'The Six Pillars for Building Big Data Analytics Ecosystems', *ACM Computing Surveys*, 49:2, No. 33 [doi:[10.1145/2963143](https://doi.org/10.1145/2963143)]

Kitchin, R. (2016), 'Big Data', in Richardson, D. et al. (eds), *The International Encyclopedia of Geography* [doi:0.1002/9781118786352.wbieg0145]

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Verhoef, P.C., Kooge, E. and Walk, N. (2016), 'Creating Value with Big Data Analytics: Making Smarter Marketing Decisions', Routledge: New York.

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IBM (2010), 'Analytics: The new path to value', IBM Institute for Business Value / MIT Sloan Management Review, [http://sloanreview.mit.edu/reports/analytics-the-new-path-to-value/]

McKinsey (2016), 'The need to lead in data and analytics' [http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-need-to-lead-in-data-and-analytics]

McKinsey (2015), 'Six building blocks for creating a high-performing digital enterprise', [http://www.mckinsey.com/business-functions/organization/our-insights/six-building-blocks-for-creating-a-high-performing-digital-enterprise]