Incorporating Tabletop Visual Analytics into the Decision-making Process: A Case Study of Retail Banking

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Why Visualization?

- Dealing with digital data is getting impossible
  TB’s of data at each company
  TB’s of data for each city every day.

- Visual Communications
  GB’s of data at each mailbox

- The Ultimate Design Challenge
  Easy to read, understand and navigate in data flow.
Analytics Workflow Revisited

- Data Lake
- Data Transformation
- Visual Exploration
  - Data Augmentation, Aggregation
- Narrative Generation
  - Time, Place, Characters, Interactions
- Storyline Design
Social Network Visualization

- Interactive investigation of Social Networks
  - Identify key players, opinion leaders,
  - Identify fraud, crime networks
Enron Corpus
We are still away from ...

**The Fall of a Giant**

Former Enron chief executive Kenneth L. Lay, who prosecutors allege earned $427 million from the sale of Enron stock options and restricted stock between 1998 and 2001, was charged Wednesday with 11 counts including fraud, conspiracy, and making false and misleading statements. Some of the 2001 statements in question:

- **Aug. 30**
  - **ANALYST CALL**
  - "There are absolutely no problems that had anything to do with Jeff [Skilling's] departure ... no accounting issues, no trading issues, no reserve issues ... I can honestly say that the company is probably in the strongest and best shape ... that it's probably ever been in."

- **Sept. 26**
  - **EMPLOYEE ONLINE FORUM**
  - "The third quarter is looking great. We will hit our numbers."

- **Oct. 12**
  - **CALL WITH CREDIT RATING AGENCY**
  - Enron and its auditors had "scrubbed" the company's books and no additional writedowns would be forthcoming.

- **Oct. 16**
  - **ANALYST CALL**
  - "In connection with the early termination of the Raptor hedges, shareholders' equity will be reduced approximately $1.2 billion."

- **Oct. 17**
  - **EMPLOYEE MEETING**
  - "Our liquidity is fine. As a matter of fact, it's better than fine, it's strong."

- **Nov. 12**
  - **ANALYST CALL**
  - "We don't have anything we're trying to hide. ... One reason we went ahead and did this preliminary review with (auditing firm Arthur Andersen) before we released these earnings is to make sure we didn't have any other goodwill adjustments except the $500 million."

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**Financial Transactions**

- **Aug. 14**: Lay raises $50 million in new stock.
- **Aug. 23**: Lay signs off on quarterly report.
- **Sept. 3**: Lay and CEO are accused of price manipulation.
- **Oct. 31**: SEC inquiry upgraded to formal investigation.
- **Nov. 2**: Lay resigns as chairman of Enron.
- **Dec. 2**: Enron files for bankruptcy protection.
- **Jan. 23**: Lay resigns as CEO of Enron.

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**Sources:** Department of Justice, Securities and Exchange Commission and Bloomberg News

**Graphic by Karen Youssef-Iqbal and Farhana Mossad—The Washington Post**
Collaborative Visual Analytics

- A Visual Analytics System based on Spatial Augmented Reality and Physical Visualizations
- Design and build a spatial augmented reality system with multiple displays
- Define tangible interaction models
Motivation

Analytics Experts:
Include decision makers into analytics workflow to optimize resources / process

Executives:
Fast data driven decision making
Insight into data
Business Problems Require Fast Analytics

- **Customer Profile**
  - Segmentation
  - Subsegmentation

- **Customer Behaviour**
  - Attrition / Retention
  - Loyalty Actions

- **Customer Value**
  - Customer Profitability
  - Customer Life Time Value

- **Service Modelling**
  - Service Modelling Algorithms based on Customer Value

- **Product Analysis**
  - Propensity Models
  - Sequence Analysis
  - Association Analysis

- **Financial Analysis**
  - Customer Based Income & Expense Models
  - Product Based Income & Expense Models

- **Pricing**
  - Customer Price Sensitivity Models
  - Product & Customer Based Pricing

- **Revenue Analysis**
  - Current & Potential Revenue Analysis

- **Customer Potential**
  - Customer Potential Profitability
  - Customer Potential Segment/Subsegment

- **Risk Analysis**
  - Potential Loss Predictions

- **Loyalty Actions**
  - Customer Value
  - Customer Profitability
  - Customer Life Time Value

- **Current & Potential Revenue Analysis**

- **Potential Loss Predictions**
Case Study: Catchment Area Analysis

- ATM/Branch location optimization is mission critical for retail banking

- Optimize: Whether or not the customer catchment areas of these branches have the best coverage

- Actions: Open / Relocate / Close ATM / Branches
Decision Making Workflow

Analytics → Reporting → Presentation → Decision

Revision / Update → Decision

REAL TIME
Hybrid Visual Analytics System
Case Study: Data and Interactions

- **Data**
  - 4M Transaction data over three months
  - 400,000 anonymous account owners,
  - 140 branches

- **Interactions**
  - Start/Pause Animations
  - Select Branch
  - Change Catchment Area Size
Case Study: Visualizations

- Physical Visualization
  - Height to the scale 3x

- Data Visualization - Animated Heat Maps
  - Monetary Value of Transactions
  - Density of Transactions
  - 1h, 2h and 24h time steps for animations

- Data Visualization - Scalar Values
  - Pie and Bar Charts
  - Data for selected Branch
  - Interactive change of value
Design Decisions: 3D Print
Touching the Data changes perception
Research Questions

Are the analysis and decision-making processes involving conventional methods (such as spreadsheets, presentation, statistical analysis tools) and interactions (such as 2D displays, mouse, and keyboard) sufficient to effectively discuss extensive and complex scenarios?

Is there more into BusinessVis than just dashboards?
Observations of Bank Team:

- Summaries or charts of vast amount of transactional data lead to missing details as well as misunderstandings
- Dashboards and branchwise representation of information degrades the recollection of previously discussed issues
Research Questions

From which perspectives do new intra-group interactions, conversational hierarchy, and idea flow emanating from hybrid visual analytics systems differ from those conventional ones?
Research Questions

Observations from Lab Team:

• Interactive shared spaces **catalyze idea flow**

• Physical existence of visualization and the facilitation of all team members in a natural social setting encouraged social interactions

• From one way communication to two way communication
Discussion

• Visual analytics system involving physical visualizations may significantly enhance the decision-making process since the increase of idea flow and conversation positively affect the creativity and productivity of the group.

• Usability Tests
  • Group Behavior
  • Idea Flow
  • Decision Making Process

• Spatial AR to support annotations and private views
Akbank (Top National Bank)

- Identification of Customer Journey Key Events
- Behavioral Analysis of Credit Card Spending Patterns together with Customer ATM and Branch Visit, Mobile Internet Usage over 100,000 Customers over 12 months.
- Visual Analytics Tool to Explore Transaction Data together with Point of Sale Data
National Insurance Bureau

- Fraud Analysis of Traffic Incidents
- Identification of Fraud Networks abusing Multiple Insurance Companies
- Multiple parities: Drivers, Garages, Insurance Experts
- Data: Behavioral Analysis of Traffic Insurance Claims over last 3 years.
- Goal: Improving Fraud Detection.
Energy

- 440 temperature sensors
- Public places such as classes have smaller temperature variance. Offices have greater variances.
- Between 5am-10am temperature difference both office and classes is higher than others
- 50 Wifi routers
Research Directions

• Analytics Algorithms and Tools
  • Business Interactions: Marketing, Fraud
  • Intelligence Services, Cybersecurity
  • Domain Specific Scenarios: Finance, IoT

• Big Data Analytics Workflow
  • Important data points in the data lake
  • Create Storylines / Narrative
  • Collaborative / Tangible Interfaces
Research Directions

Accelerate Analysis for Decision Making

Generate narratives from Data

Facilitate collaboration and telepresence for Analytics
Research Directions

- Working together on Data Driven
  - Trans-disciplinary Problems
  - Behavioral Analytics
  - Spatial Analytics
  - Usability Studies
  - Touch Interfaces
  - Display Technologies
Lab

- 5 PhD, 1 M.S and 1 Undergrad Students
- Research collaboration via exchange of researchers between the two labs
  - 1 SU researcher @ MIT for 1-2 semesters
  - MIT researchers @ SU to deliver seminars and participate in research
Executive in Residence

• A sounding board to offer feedback from real world business perspective

• Establish new links between business questions and research activities

• Dr. Atilla Bayrak, Akbank is Executive in Residence for the next two years.
THANK YOU