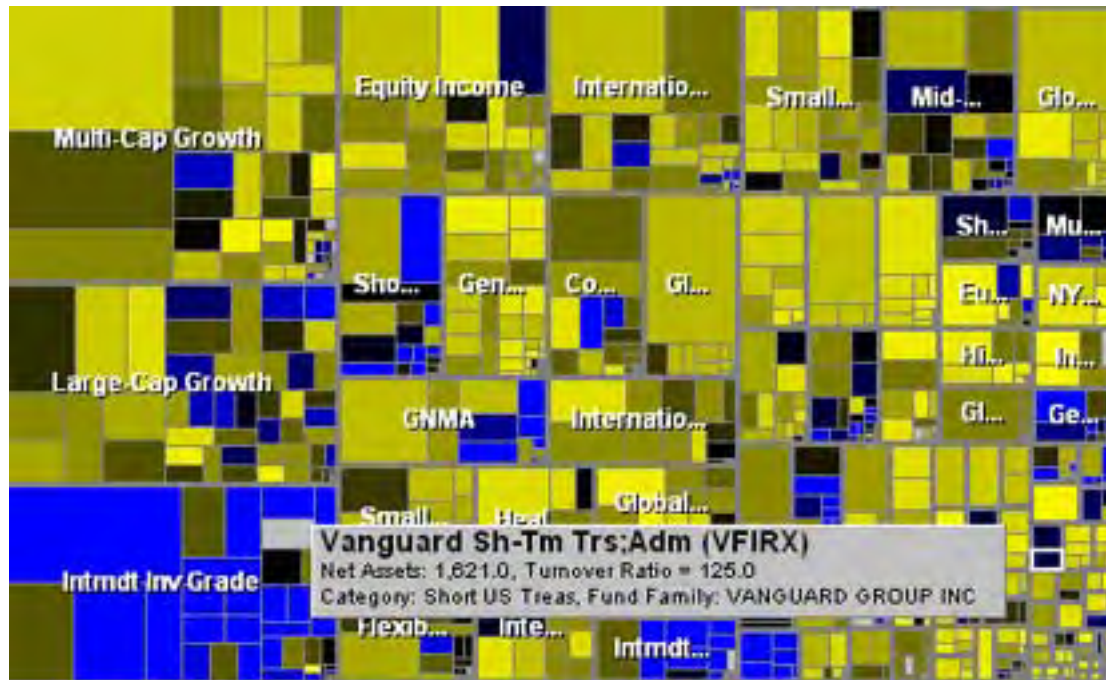


FinFoMoGo: Financial Info Management for People on the Go

Aaron Marcus, President, AM+A



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Aaron Marcus, President
and Principal Designer/Analyst
Aaron Marcus and Associates, Inc.
1196 Euclid Avenue, Suite 1F,
Berkeley, CA 94708-1640, USA
Tel: +1-510-601-0994, Fax: +1-510-527-1994
Email: Aaron.Marcus@AMandA.com
Web: www.AMandA.com

*Acknowledgement: Hong Qu, AM+A Designer/Analyst Intern
(Graduate Student, UC Berkeley, SIMS Program)*

Lecture Objectives

- Introduce best practices for visualizing financial data
- Apply information visualization theory to convey personal finance information to individual investors
- Investigate the challenges of designing information visualization for a mobile context

What's the Challenge?

- How can we help individual investors understand the health of their financial assets?
- What kinds of financial information do investors want to see on their mobile device when they are on the go?
- Can we apply user-interface design and information-visualization best practices to convey key financial data and investment principles?

Design Solution Principles

- **Simplicity:** Give user what s/he needs/wants, but no more, enabling drill-downs
- **Clarity:** Make displays suitable for small screens, quick peeks, rapid understanding
- **Consistency:** Keep displays as consistent as possible among themselves and with established industry conventions

UI Design Components: Definitions

- **Metaphors:** Ideas via words, images, sounds
- **Mental Models:** Structure/organization of data, functions, tasks, goals, roles, people at work, play
- **Navigation:** Movement through mental models via windows, menus, links, buttons
- **Interaction:** Input/output devices, feedback, overall behavior of human-computer systems
- **Appearance:** Visual, verbal, sonic, tactile; perceptual attributes
- **Info Visualization/Sonification:** Structure, process via tables, forms, charts, maps, diagrams

UI Development Process

- Plan
- Research
- Analyze
- Design
- Implement
- Evaluate
- Document
- Train
- Maintain

UI Design Method: User-Centered Design (UCD)

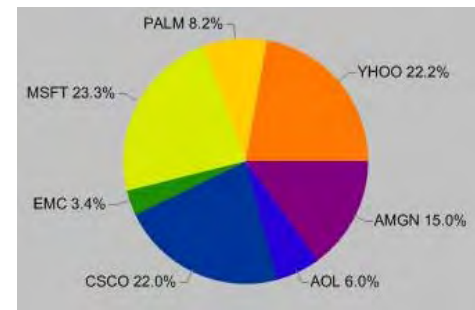
- Opposite direction from data-driven, or technology-driven design
- Objective: Determine deep user needs/desires
- Usability = efficiency, effectiveness, satisfaction
- Usability not enough!
- User experience: usability, usefulness, appeal
- UCD characterized by iterative, partial design, evaluate, redesign cycles
- UCD requires skills of many disciplines

Source: Communication across the HCI/SE divide: ISO 13407 and the Rational Unified Process.

<http://hdcp.org/Publications/JohnHCII03final.pdf>

Current Info Viz Techniques

- Line/Bar Charts
 - Stock performance over time
- Pie Charts
 - Portfolio allocation
- Star Rating
 - Mutual fund rating
- Tree Map
 - Heatmaps
- Tabular Data
 - Data tables

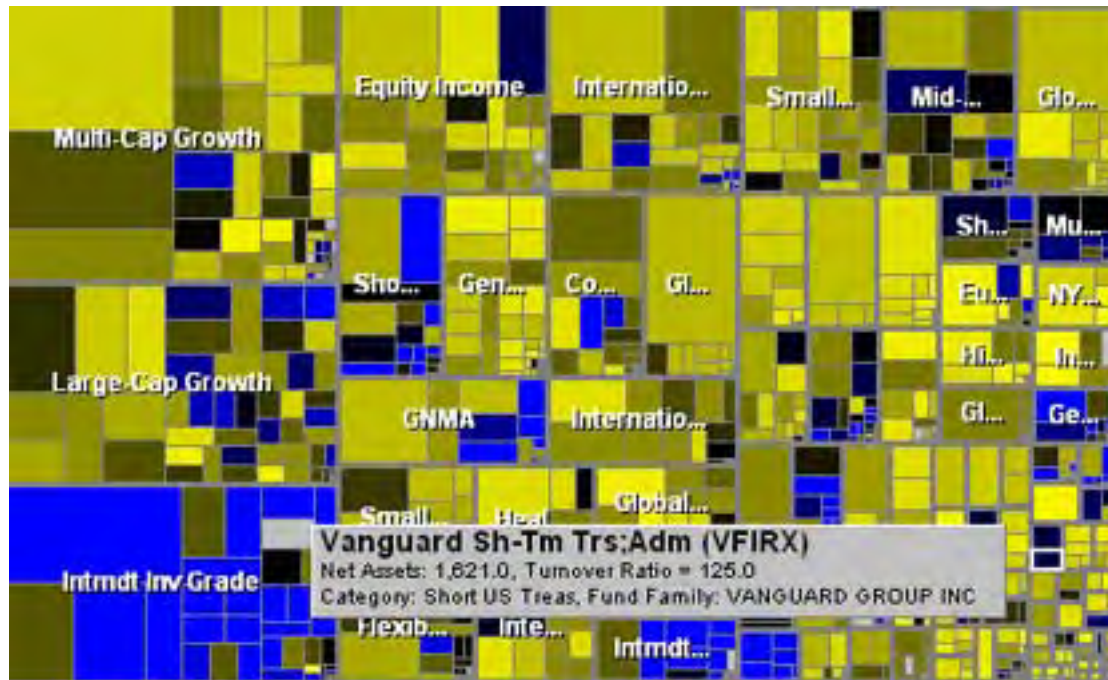


What works for mobile devices?

- **Tree Map**
 - Aggregates data points into a single visual
 - Easy to recognize patterns in the data
- **Line/Bar Charts**
 - Depicts trends over time
 - Easy to gauge investment performance
- **Sonification**
 - Audio feedback adds another modality to the UI
 - More natural to interact with cell phone using sound

Tree Maps

- Visual pattern recognition
- Condense a million data points into a single view
- Color coded to to highlight opportunities and risks



Source: SmartMoney, University fo Maryland

Risk/Reward Chart

- Conveys level of risk vs. return on investment
- Evaluate multiple investment products by comparing their risk/reward ratios

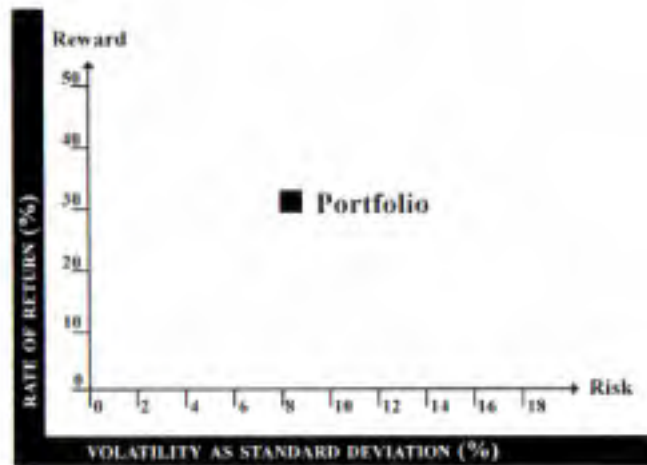


Figure 4. Risk-reward matrix

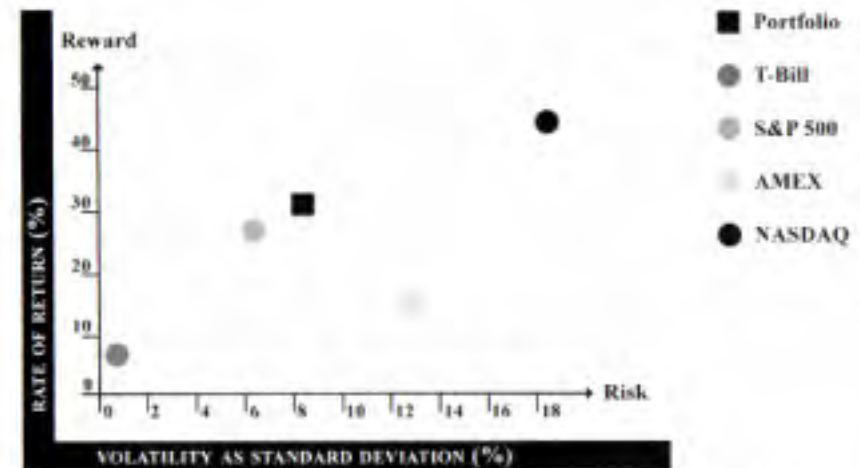
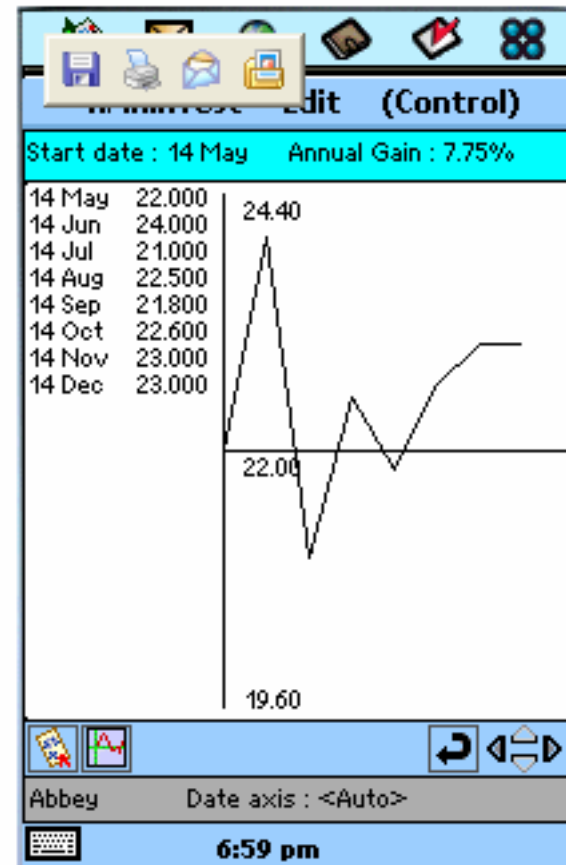


Figure 5. The individual portfolio vs. other benchmarks

Source: Wes Ervin, "Visualizing Uncertainty" *Information Design Journal*

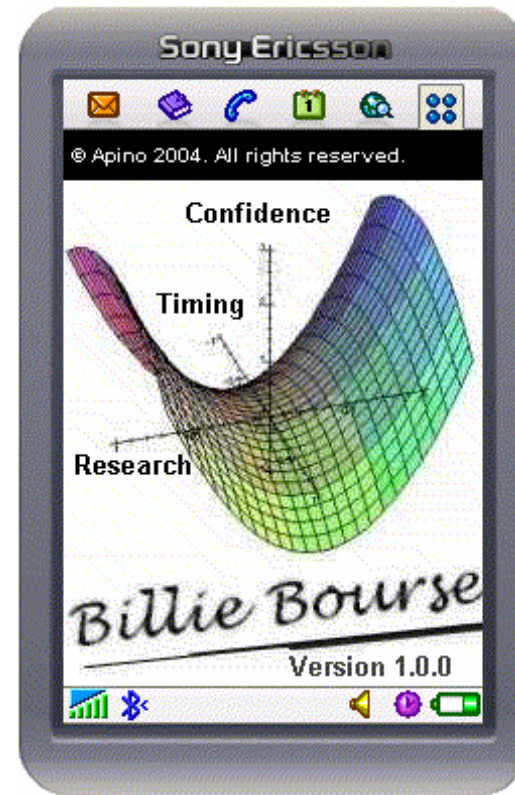
Gain/Loss Chart

- Displays gain or loss accumulated over time
- Quickly gauge performance
- Can be presented in percentage or absolute terms
- Mobile solution with UIQ OS



Current Technology Example 1: Billie Bourse

- Billie Bourse for Symbian UIQ OS
- Sony Ericsson P800/P900/P910
- Shows intraday data and performance charts



Current Technology Example 2: Charts

- Charts: dominant info viz technique to represent investment performance over time
- Multiple investments can be overlaid for comparison
- Zoom in or out on any period of time



Source: <http://www.smartquant.com/help/chart>

Assumptions of Mobile UI Design Solution

- Investors need and want innovative, personalized information visualization
- Investors may wish to check their finances at any point during the day
- Investors may or may not want to do long range financial planning and analysis
- Investors are not necessarily investment professionals: they may need simpler, innovative solutions

Users and Use Contexts

Users:

- Early adaptors of technology
- Eager participants in personal investing

Use contexts:

- Standing waiting in queues
- Sitting or standing during commutes
- Sitting or standing at rest, *e.g.*, in parks, in bathrooms, at events

Example Users

■ User 1: Ben

- Young adult, age 30
- Net Assets \$100k
- Male
- Single
- College education
- Technophile

■ User 2: Sarah

- Age 60
- Net Assets \$1 million
- Female
- Married
- Graduate school education
- Technophobe

User Profiles

Ben



- Lives and works in town as manager of a bakery, lives alone, earns about \$50K/year, commutes by bus, active social life, invests with interest in profits, willing to take more investment risks.

Sarah



- Lives in suburbs, works downtown as executive assistant, married, mother of two children, commutes with van, planning for retirement, invests with care, conservative investor.

Use Scenarios

■ Ben

- How did my portfolio perform this week?
- Show I take profit on a volatile stock?

■ Sarah

- Is my portfolio allocation too risky?
- Where should I invest my extra cash?

Use Scenario 1: Ben

- Inquires: How did my portfolio perform this week?
- Wants: quick views, quick results
- Task: Uses heatmaps to drill down his portfolio, accounts, and equities
- Next: then moves on to games or music or conversation

User Scenario 2: Ben

- Inquires: Show I take profit on a volatile stock?
- Wants: Find out how much profit he will make if he sells the stock right now.
- Task: Reads the latest company headlines; glances at the gain/lost graph
- Next: Sells the stock at 20% profit.

User Scenario 3: Sarah

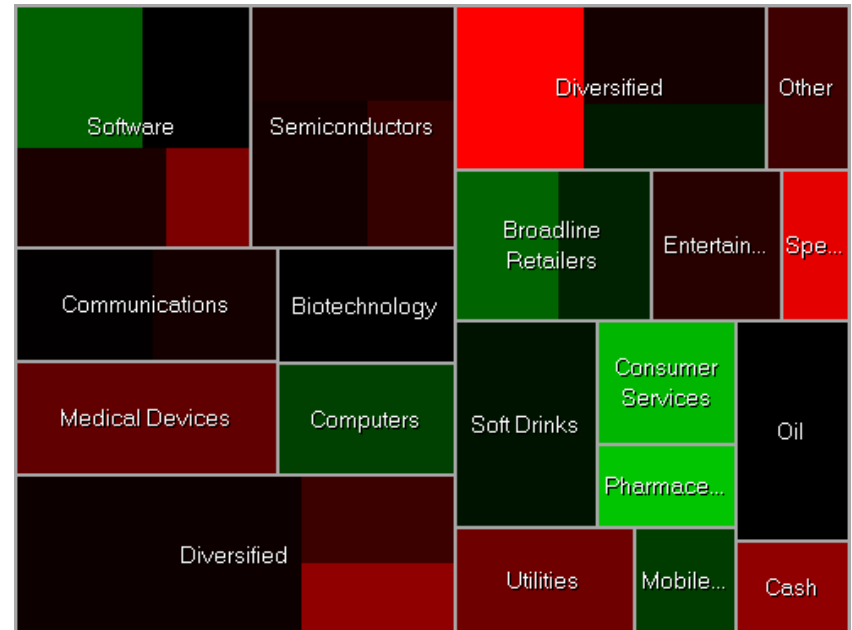
- Inquires: Is my portfolio allocation too risky?
- Wants: What are trends? What are my goals?
- Task: Brings up the risk/reward graph to evaluate her portfolio against indexes
- Next: See that her investments are too risky. Call her broker to sell high-risk investments

User Scenario 4: Sarah

- Inquires : Where should I invest my extra cash?
- Wants: An investment product with minimal risk that earns more than 4% annual returns
- Task: Looks through a table of the best performing mutual funds in the past 5 years; plots the top 3 funds on a risk/reward chart
- Writes down the fund symbols to show her financial advisor next week

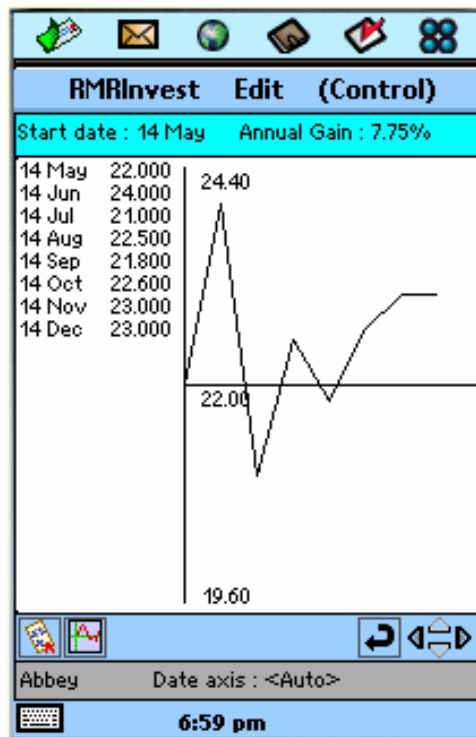
Apply Information Visualization Theories

- HeatMap
- Risk/Reward Chart
- Gain/Loss Chart



Mobile Device/Platform Context

- Currently available applications for PDAs and phones:



Billie Bourse by Apino Software ISV



RMRInvest Investment Manager by RMR Software

Mobile Solution

- Daily/weekly alerts of gains/loss
- Check portfolio performance at a glance
- Evaluate portfolio risk
- Timely transaction

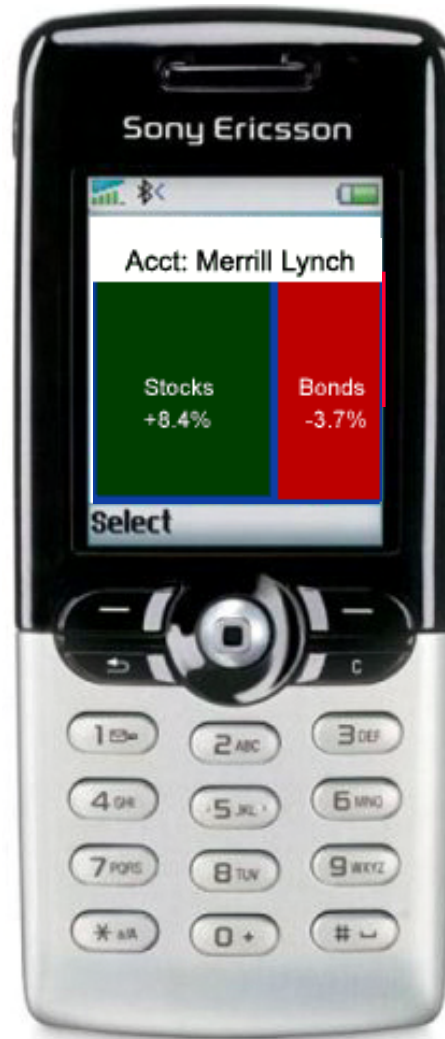
Benefits of Design Approach

- Simplicity, clarity, consistency
- Suitability to mobile platforms
- Can be tested easily
- Incorporates information visualization principles
- Adds an element of fun to the user interaction

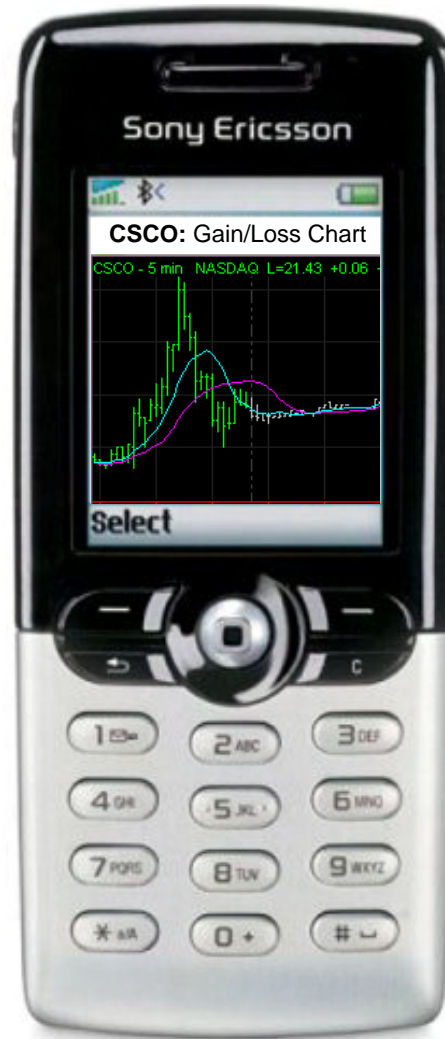
Challenges

- Small space to show any data, functions
- Menus may be long, with numerous items
- Difficult to select targets
- Names may be long
- Privacy and data security

AM+A Prototype Design 1: Use of Tree Map



AM+A Prototype Design 2: Gain/Loss Trend Chart



AM+A Prototype Design 3: Risk/Reward Chart



Results of User Evaluation

- Small number of users, but with good questions can be informative
 - Users liked the idea of tracking investments at the end of the trading day (4pm EST)
 - privacy of personal financial data: can others see their financial data by glance over or browsing through their phones
 - Users are not willing to login in because typing on a phone is difficult
 - Users want to track investments but not necessarily do planning on mobile device



Summary

- Initial design explorations enable stakeholders to see, evaluate benefits of particular solutions
- Iterative testing required to determine breakthrough success factors
- User evaluations inevitably turn up unexpected opportunities and challenges
- Users like accessing their financial data on mobile devices but want to be sure it will be safe and hassle free.
- Audio user interaction should be further explored

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Aaron Marcus, President
and Principal Designer/Analyst
Aaron Marcus and Associates, Inc.
1196 Euclid Avenue, Suite 1F,
Berkeley, CA 94708-1640, USA
Tel: +1-510-601-0994, Fax: +1-510-527-1994
Email: Aaron.Marcus@AMandA.com
Web: www.AMandA.com

*Acknowledgement: Hong Qu, AM+A Designer/Analyst (UC
Berkeley, SIMS Program)*