

**Cloud Computing Services in Finance:
Ready for Ubiquitous Computing?**

Prof. Alexander Yap, PhD
Elon University, Elon, North Carolina, ayap@elon.edu

Prof. Dr. Claudia Loebbecke
University of Cologne, Germany claudia.loebbecke@uni-koeln.de

Discussion today

- Nature of Electronic financial market
- Needs of traders/investors in financial market (systems users)
- Different user interface
- New user interface (iPad)
- Investigate cloud computing for financial services

Research Objective

Determine Cloud Computing Readiness for u-commerce/u-computing in the financial market

⇒ How is cloud computing enabling effective ubiquitous computing ?

Trading: Luck or Skill or Both?

- Luck: when Preparation meets opportunity
- Fortune: Favors the bold

"While it is better to be a lucky trader than a skillful one, being both is best"

"Sometimes, the luckiest is just the one with the best information or knowledge at hand at the right place and the right time"

Advent of Electronic Trading

- Creation of NASDAQ - Allow investors to bypass brokers and directly buy or sell stocks electronically (avoiding 1987)
- In Feb. 2006, ARCA (Archipelago) merged with NYSE And it became the 2nd largest electronic financial market

Global Financial Markets

- Global Financial markets – all inter-connected; trading trillions of dollars
- Performance of one stock market impacting others in milliseconds
- ⇒ If Shanghai stock exchange has a bad day, NYSE and NASDAQ are programmed to sell off
- ⇒ 500-600 points drop in China caused the Dow to drop 400-450 points
- ⇒ Better informed traders can react quicker or program their trades better

Dual Monitor Full Screen Interface (streaming real-time data, news, charts)



Simplistic Mobile Interface for Trading

- More *minimalistic interface*
- *Less tools* for research or charting
- *No streaming data* via cloud (or slow)
- *No Rich Media* for richer knowledge representation

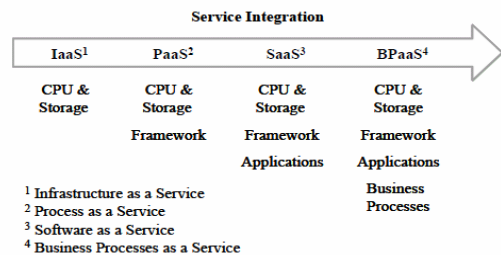


Thin Clients for Ipad

We investigate the iPad as device for ubiquitous computing and u-commerce for financial markets

Offering services similar to the desktop, but providing mobility advantages via cloud computing

Research: Service Dimensions of Cloud Computing provided by iPad ?



The Service Model Dimension of Cloud Computing

Four Applications

- Ameritrade Ipad App
- CNBC Ipad App
- NASDAQ Ipad App
- Bloomberg Ipad App

Ameritrade's Ipad Application (Streaming Real-time data)

- Three windows
- Real-time data
- Real-time charting
- Real-time news



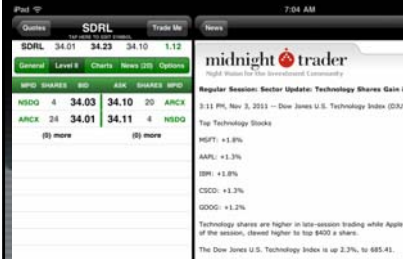
Ameritrade (Streaming Data)

- Watch List for several stocks
- Green & Red for prices for gains or loss
- Percentage & Absolute value displayed
- Stock balance
- Margin power



Streaming Level 2 Realtime Data

NASDAQ Level 2 Data available to see where BIDs and ASKS come from



Real-Time Charting

- Real-time streaming price data funneled through cloud from different electronic financial markets ...
- Real-time charting available and to be configurable
- Display from 9:30 am – 4:00 pm + after hour trading



Full Screen Charting Tools

- Different choices of display – candlestick, log, moving averages, bollinger bands, and other visual tools



CNBC iPad Application

- Real-time data
- Real time charts
- 52-week High and Low Bar chart
- Streaming News
- Streaming Videos
- Breaking News Alert



Pop-up Interface (Streaming News)



CNBC Live TV on iPad



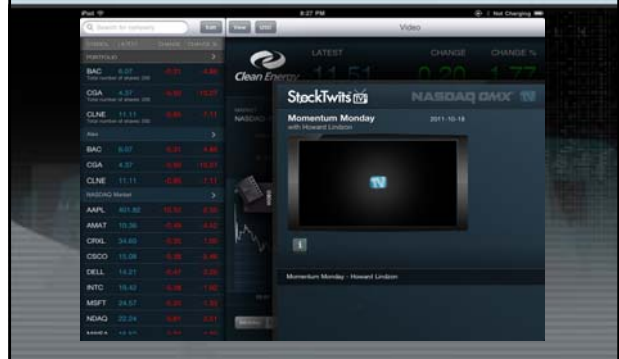
Nasdaq App – Portfolio List (Real time data, charts)



Stock Tweets



Nasdaq App : Video Commentaries



Nasdaq App: Charting Tools (Less Comprehensive than Ameritrade)



Bloomberg – News, Indices, Currencies, Commodities, Bonds



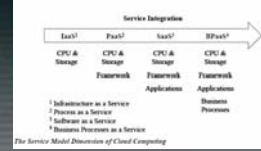
Portfolio Tracking



Cloud Computing Readiness

Cloud Computing for Business Process as a Service (BPaaS):
Transaction to buy/sell stocks, collate financial data from global market, deliver news content

- Small / thin client apps on iPad
- Number-crunching / heavy computing applications on server
- Data storage on server and streamed in real-time to iPad



Brokerage Services

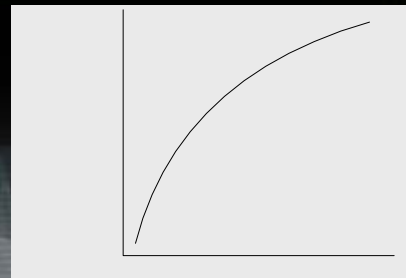


Different Trading Interfaces for Ubiquitous Trading

Cloud Computing Services (streaming data, charting, and analytical tools)

Trading Interface	MULTI-SCREEN	COMPLETE TRADING TOOLS	SIMPLE TOOLS	TALK TO A REAL PERSON	COMPACT
	REAL-TIME STREAMING DATA	REAL-TIME STREAMING DATA	SLOW DELAYED DATA		REAL-TIME STREAMING DATA
News	STREAMING	STREAMING	LIMITED	NONE	STREAMING
Research Tools	SEVERAL TOOLS	SEVERAL TOOLS	LIMITED	NO TOOLS	SEVERAL APPS
Charts	FULL INTERACTIVE	FULL INTERACTIVE	SMALL CHART	NO	LIMITED INTERACTIVE
Advantage	SEE ALL DATA AT ONCE	STREAMING DATA	QUICK TRADES	REAL CONVERSATION	COMPACT INTUITIVE INTERFACE
Dis-advantage	FIX LOCATION	SMALLER SCREEN	LACK INFO	LIMITED AVAILABILITY	STILL NOT COMPLETE
Ubiquity	Not Portable	Portable	Ultra portable	Limited	Portable

With more real time information updates and accurate knowledge, the less risky the trade



Summary / Conclusions

(1) Cloud Computing Readiness
Is extensive in Financial Markets

Delivering real-time data, real-time charting, ubiquitous commerce for buying/selling stocks, real-time video and tweeting

(2) iPad provides the vehicle for effective ubiquitous cloud computing

Compact interface, pop-ups, multi-media capability

✉ ayap@elon.edu

✉ claudia.loebbecke@uni-koeln.de