THE POSSIBILITIES ARE INFINITE

FUJITSU

AUTOMATIC FORECASTING SYSTEMS

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# CPFR Discussion and Demonstration

## April 14, 2004

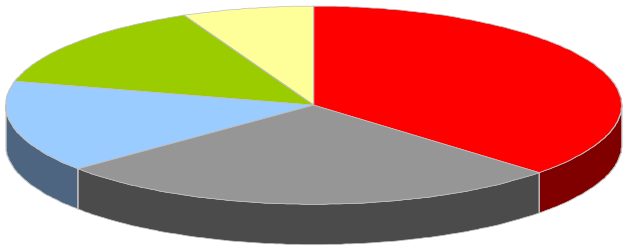
FUJITSU CONSULTING

# Agenda

- Introductions and Objectives
- Fujitsu & Automatic Forecasting Systems
- CPFR Application Discussion
- Next Steps

# Background on Fujitsu Consulting

# Fujitsu: A Leading Enterprise



## Revenue by Major Group

| | |
|---|---|
| Services & Software | 37% |
| Information Processing | 27% |
| Telecommunications Equipment | 15% |
| Electronic Devices | 14% |
| Other | 7% |

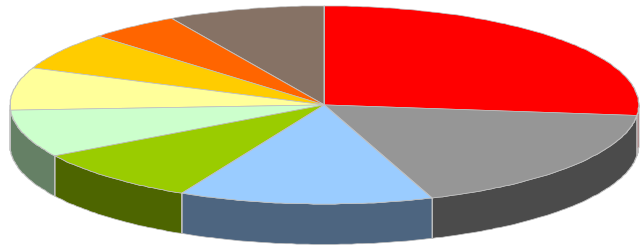
**3rd Largest Global IT Services Company**

**$43B Annual Revenue**

**180,000 Employees in 65 Countries**

**Global Services and Support Capabilities**

**End-to-End Solutions**



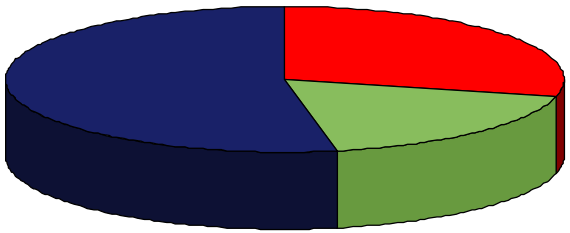
## Consulting Revenue by Industry

| | |
|---|---|
| Telecommunications | 27% |
| Financial Services | 18% |
| Media & Retail | 13% |
| Government | 9% |
| Industrial Manufacturing | 8% |
| Travel & Transportation | 7% |
| Professional & Technology | 6% |
| Energy Services | 5% |
| Health Sciences & Other | 8% |

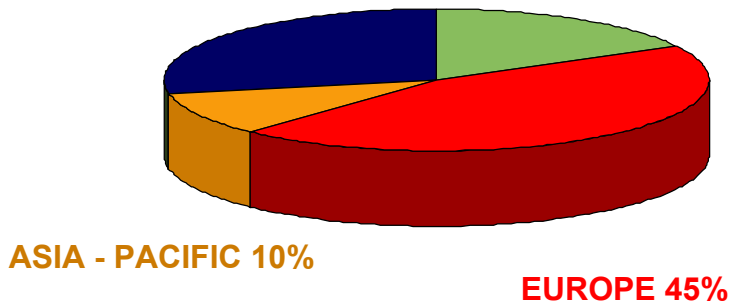
# Fujitsu Consulting: Fast Facts

- Consulting and Services arm of the Fujitsu Group
- 7,000 employees in 70 locations worldwide
- Strategic member of the Fujitsu family of companies

## Fujitsu Consulting Revenue by Service




## Fujitsu Consulting Revenue by Region



# Fujitsu Retail Clients

# Evolution of Business Intelligence

## Data

- Presentation of Historical Data in both Tabular, Graphical Descriptive Form

## Information

- Development of an Inferential Model – Hypothesis Generation

## Understanding

- Converting the Statistical Model solution through understanding of the business

## Control

- How to employ the Information to maximize value such as setting prices for multiple competitive products, simultaneously

# AFS Testimonials

**"If you want the program to do the work for you, without a large staff of analysts, and you want to consider all possible variables and results, then you want Autobox…You won't find another program that does what Autobox does, at least not nearly as well, which is basically saying the same thing."**

*Fred Andres*
*Manager of Logistics Strategies*
*Anheuser-Busch (A-B)*

**"Autobox is quite simply the best demand forecasting program on the market today. It properly identifies outliers, pulses, level shifts and seasonal adjustments, including day-of-week effects, and then uses those results to accurately forecast future demand. I've found no other program that does this automatically. Autobox is simply the best – period."**

*Mark Frost, Ph.D., MSAE, MPA, CFA, CSP.*
*Director: Econometrics, Forecasting & Decision Science*
*Carreker Corporation – Cash Solutions & Logistics Group*
*(Also Professor of Economics at SMU)*

# Why Fujitsu Consulting and AFS ?

- **Business intelligence is a core service offering at Fujitsu Consulting**
  - in line with strategy of addressing real business problems with real business solutions
  - understand how analytics play a key role in preserving and maximizing revenue
  - data mining leading to better **information** is a goal for most retail organizations
- **Benefit to Kemps of having an international consulting firm partnered with a best-of-breed, proven forecasting software solution**
- **Close relationship between the two companies at a senior management level**
- **Fujitsu researched and developed the case studies on the AFS web site**

# Automatic Forecasting Systems

# Automatic Forecasting Systems

***Founded in 1976, Autobox is the leader in OEM sales. AFS has focused on providing Autobox as engine to business partners who provide value added integrated solutions.***

## Partial List of OEM Partners:

- ***Fujitsu Consulting – www.fujitsu.com***
- Carreker Corporation – www.carreker.com
- Strategic IT –www.strategicit.com
- Market6 Corporation - www.market6.com

# What level to model your data?

## This Depends on Your Objective

- Strategic vs. Tactical
- Aggregation
- National level for the entire market
- National level for YOUR SKU
- Store level by SKU
- Time
- Monthly
- Daily/Hourly

*Principles of Forecasting: A Handbook for Researchers and Practitioners*, J. Scott Armstrong (ed.): Norwell, MA: Kluwer Academic Publishers, 2001

# Diffusion Of Forecasting Principles:

# An Assessment of Forecasting Software Programs


## Len Tashman* and Jim Hoover**

**School of Business Administration, University of Vermont Burlington, VT 05405*

***United States Department of the Navy,2000 Navy Pentagon (N412H) Washington, DC. 20350*

# Quote from Steven DeLurgio

Author of "Forecasting Principles and Applications"

**"There are extraordinary benefits to be achieved in Supply Chain Management through the use of sophisticated and flexible forecasting software packages such as AUTOBOX."**

# Two types of modeling approaches

1. **Using the History Only**


2. **Using the History plus expected events (i.e. holidays, price, promotion, day-of-the-week , week-of-the-year, temperature etc.)**

# What does Autobox do?

**AUTOBOX:**

automatically **tailors forecast models** to problems with the best weightings. It **corrects for omitted variables** (e.g., holidays or price changes that have unknowingly affected the historical data) by **identifying pulses**, seasonal pulses, level shifts and local time trends, and then **enhances the forecast model** through dummy variables and/or autoregressive memory schemes.

# Why is This Important to Kemps?

**Analysis of a "real world" scenario for Kemps:**

- **Received store level scan data – over 2 years of daily scan data from Pick 'n Save**
- **Produced a 90-period out forecast for one product #111509900 (2% milk) with historical data and future values of the suggested causals**
- **Looked at effects of possible cannibalizing products: #111509903, #111509906 and #111509910**
- **Included standard national holidays in analysis**
- **Included an indicator for the first week of the month, in order to test relevance of government subsidies**

# Why is This Important to Kemps?

## Initial conclusions

- **The price of item #111509910 is quite important, suggesting the higher price of that item, the higher the demand for #111509900, the item we are predicting**
  - Suggests these two items are substitutes
- **Strong day-of-the-week effect and strong week-of-the-year effect**
- **Dynamic dependence – dependence on previous day's sales and sales 7 days prior**
- ***Some* holidays were important**
  - New Year's – one period lead effect and contemporaneous effect
  - Easter – two period and one period lead effect, and one period lag effect
  - Memorial Day – one period lead effect
  - Halloween*, Labor Day, Mother's Day*, Father's Day* – contemporaneous effect

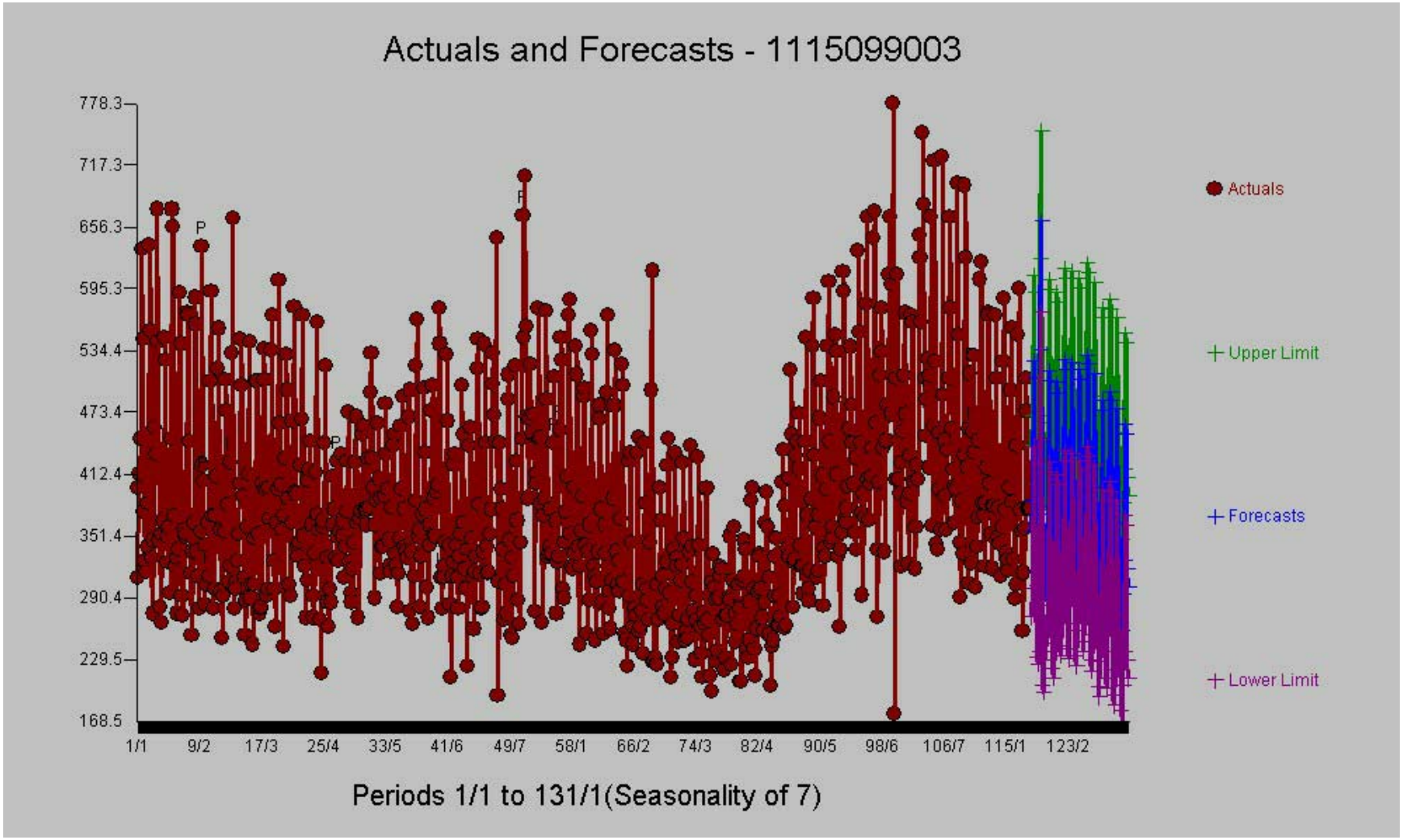

*These three holidays have significant lower demand perhaps reflecting a non-shopping day

# Why is This Important to Kemps?

## Initial conclusions

- ***Some* holidays were important (cont.)**
  - Thanksgiving – two period and one period lead effect
  - Christmas – three period, two period, and one period lead effect
- **A number of days were identified as being "peculiar"**
  - It was discovered that there were certain days or events in the past when peculiar or inexplicable demand (sales) reflecting variables was observed.
    - These are "surprises" to the system or equation and warrant investigation to uncover the assignable cause.
    - This suggests the need to analyze the information and possibly identify additional causal variables you were not aware of, also known as "management by exception"
  - These are often referred to as "peculiar data" and are quite important in the model discovery process

# Sales History and Forecast



# Why is This Important to Kemps?

## Further analysis

- Cannibalization was identified between the price of one-gallon and ½-gallon cartons of milk
- Demand for gallons of 2% milk was independent of the price – the item is a staple
- People will switch to gallons of 2% milk if you increase the price of a substitute item, which is 1/2 gallons of 2% milk
- There is a strong week-of-the-year effect, reflecting a pattern of demand that systematically changes with the calendar -- may reflect weather or temperature variation or some other embedded pattern like vacations, etc.
- On Halloween, Father's Day and Mother's Day , people don't buy milk, perhaps because they don't shop on those days

# Active AFS Projects involving Supply Chain Initiatives

- **Anheuser-Busch** needs to forecast 80 items for 700,000 retail outlets by Day
- **Carreker** forecasts 90,000 atm machines cash requirements by Day
- **SYSCO** wants to forecast for 6,000 customers for each of its 40 DC's initially by Week then by Day.

# *Improved Ordering: Forecast – Two Processes*

- **Build Models**
  - *Done at startup and periodically (every 2 to 12 weeks) thereafter.*
  - *Based on two year history by store, brand, and package if active for at least a year.*
  - *ARIMA models with transfer functions for causal variables.*
  - *Since this is done in the background, computation time is not critical.*
- **Apply models to generate forecast**
  - *Done automatically each day and when reps request an order by wireless connection.*
  - *Computation time is very critical since a sales rep is waiting for the result.*

# *Improved Ordering: Forecast – Causal Variables*

**Price –** *average price paid by consumers by store, brand, package, and day.*

*Price of similar AB products e. g. Bud Light 12 pack and 18 pack cans – price promotions of one cannibalizes sales of the other.*

**Holidays –** *Indicator variables that are 1 on the day of the holiday and 0 otherwise.*

**Events –** *Indicator variables that are 1 on the day of the event and 0 otherwise.*

**Temperature**

**Day of week indicators** *(Automatically included by AUTOBOX)*

# *Improved Ordering: Forecast – Causal Variables*

**No limit to the number of potential causal variables:**
*we will add new ones as we discover additional business relationships.*

**Potentials:**

- **Weather –** *snowfall, precipitation, low temperature, cloudiness, heat index, wind chill, severe weather.*
- **Events –** *home game schedules, local events, strikes, earth quakes.*

**The process of discovery of new causal variables:**

- *Is unpredictable – It never ends up where we expected.*
- *Driven by gleaning patterns from historical forecast error and outliers identified by Autobox.*
- *Often leads to causal variables we didn't know existed.*

# Improved Ordering: Forecast – AUTOBOX

## Autobox automatically:

- Identifies starting ARIMA structure
- Estimates initial coefficients for ARIMA terms and causal variables including up to 4 days lead and lag on holidays and events.
- Identifies three types of historical anomalies:
  - *One time outliers or pulses*
  - *Level shifts*
  - *Outliers that are repeated on the same day every week.*
- Iteratively does necessity and sufficiency tests until all remaining variables are necessary and sufficient.

# The Anheuser-Busch Solution

- Historical data is collected and stored in order to develop models.
- Actual inventory is used to impute recent sales
- Actual (recent data) is collected and delivered to the ABOXLITE MODEL along with proposed price points and promotion plans for purposes of creating updated forecasts.

# Forecasting on The Fly (ABOXLITE)

1. Models are developed and archived
2. Models are recalled when needed to create a forecast.

# Anheuser-Busch Inc. – Supply Chain Planning

**1964 – Collaborative AB/wholesalers effort to:**

- *Forecast sales to retailers*
- *Fulfill orders*
- *CPFR before it had a name.*

**1975 – Introduced linear programming to plan monthly production and distribution.**

**1992 – Moved from monthly to weekly planning.**

**1994 – Reengineered the supply chain to handle the explosion in small volume products.**

**2000 – Began planning the last mile of the supply chain – wholesaler to retailer`**

# What do they have in Common….. Besides AUTOBOX ?

1. Sales depend on Events and Holidays
2. All have strong daily and weekly patterns
3. All have Price and Weather dependency
4. Correct Model has to be customized to the data

# Council of Logistic Management Meeting 2003

## Anheuser Busch (Mike Willis) presented their Extended pilot results using Daily SKU forecasts by store

- The team implemented EOW in 73 stores in a second test market
- Results were again favorable
  - Stock-outs reduced 51%
  - Sales (stat cases) up 5.8%
  - Retailer inventory down .1%
  - Deliveries remain unchanged
- We are continuing to implement EOW with our wholesalers and retailer customers

# CIO Magazine 7/15/03

***"Logistics executives at Procter & Gamble found that the further away your data is from the point of sale, the more data accuracy decreased and forecasting errors increased."***

http://www.cio.com/archive/071503/future.html

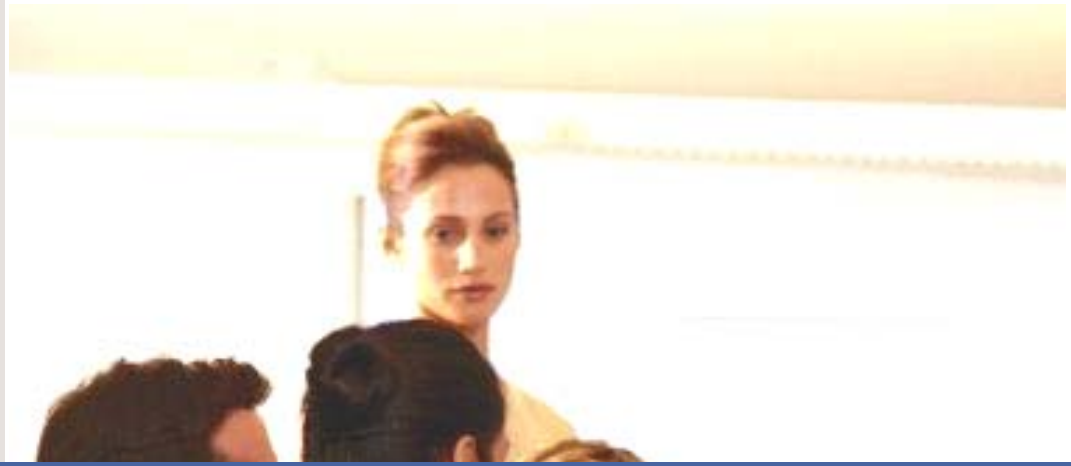
# Time Magazine 1/05/03

"…*The system could predict the optimal number of cases of Gatorade, in what flavors and sizes, a store in Laredo, Texas, should have on hand the Friday before Labor Day. Then, if the weather forecast suddenly called for temperatures 5 degrees hotter than last year, the delivery truck would automatically show up with more."*

http://www.mindfully.org/WTO/2003/Wal-Mart Bigger5jan02.htm

"..*The company has been analyzing every purchase made over the past 10 years, looking at the relationships between the items people buy and hundreds of other variables such as time of day and price. The data miners are constantly searching for exploitable relationships?"*

*"Walmart is looking to do what Autobox already does."* Dave Reilly



# CPFR Application Demonstration

# Our Understanding

- Marigold Foods, LLC is the manufacturer and marketer of Kemps premium dairy products
- One of Marigold Foods' best customers, the Pick 'n Save grocery store chain, has requested better demand forecasting capabilities for the Kemps products that they purchase
- Marigold Foods would like to develop a forecasting solution using Autobox (v5.0), the best-of-breed forecasting software application from Automatic Forecasting Systems (AFS)
  - Implement better forecasting for Pick 'n Save
    - 100 products at 100 stores (10,000 SKU's)
  - Develop a packaged, Marigold Foods-branded forecasting solution to offer to other key customers of Kemps products

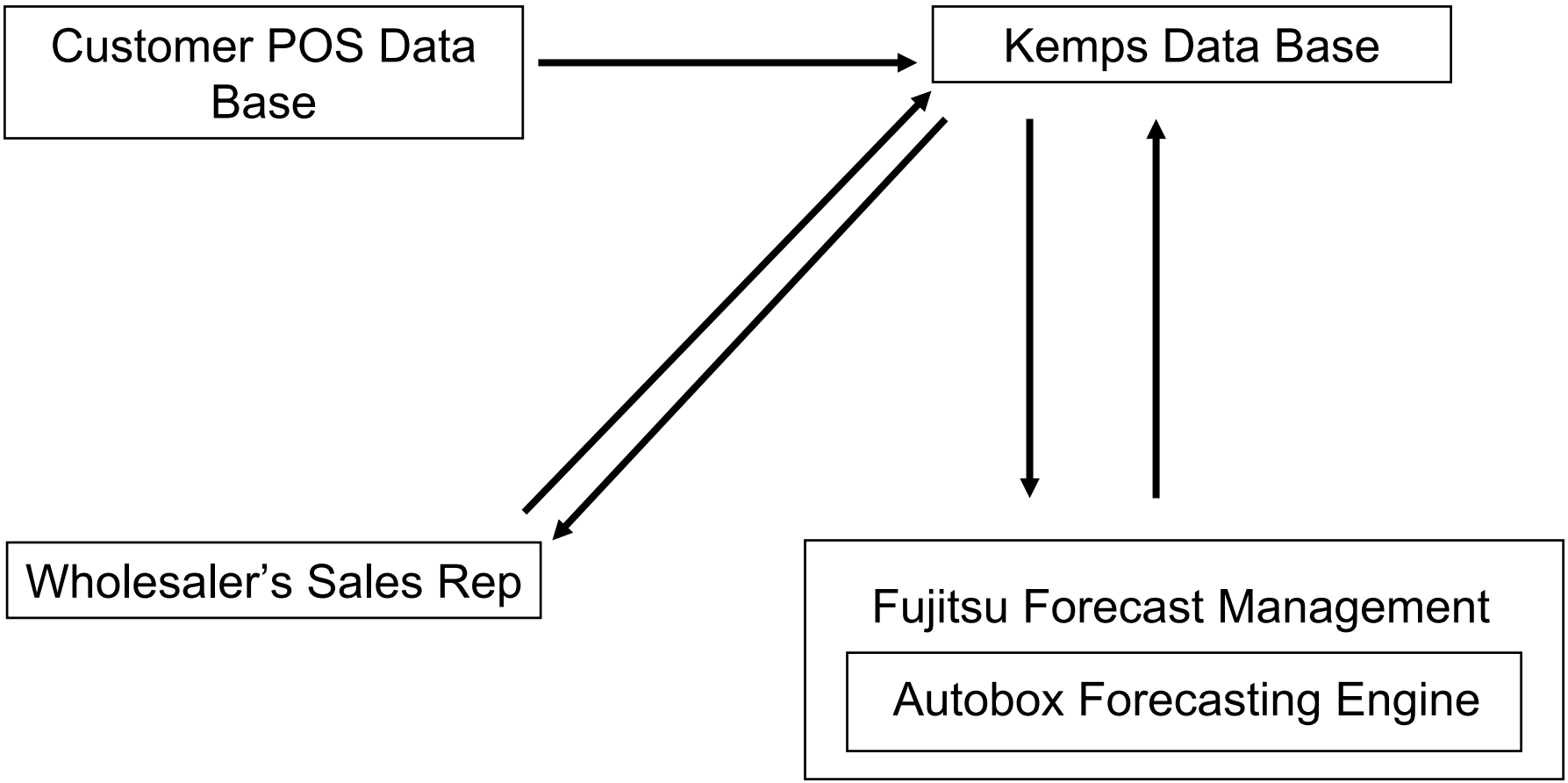
# Improved Order Generation Process (Efficient Order Writing)

Suggested order is delivered to sales rep while in-store by:

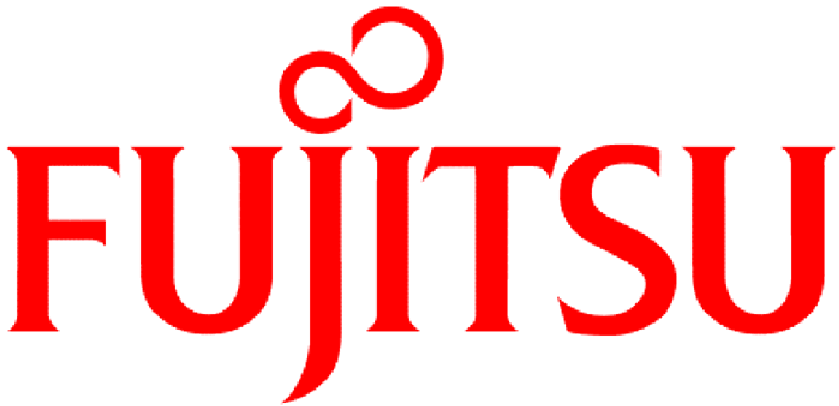
- Using retailer scan data to forecast sales between delivery periods recognizing…
  - Weather
  - Future price
  - Holidays
- Adding safety stock to protect against stock-outs
- Subtracting up-to-date inventory

- *Uses intuitive & static build to build to quantities*
- Fills shelves and/or displays from backroom inventory
- Takes inventory
- *Calculates order by subtracting inventory from build to quantity…done by handheld*
- Adjusts order as necessary
- Reviews order with store manager
- Transmits order to Route Accounting System

# Efficient Order Writing (EOW) Systems Structure



# Demonstration

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