

Consumer Aware Warehouse Management SDMay20-25



Advisor: Goce Trajcevski

Client: Jimmy Paul, Crafty LLC. CTO

Team: Lindsey Sleeth, Omair Ijaz, Andrew Smith, Sam Stifter,
Jameel Kelley, Elijah Buscho

<http://sdmay20-25.sd.ece.iastate.edu/>

Client Background

Crafty LLC helps companies enhance their employees life at work by providing offices with food, beverage, and event management



Craft A Better Workplace

Project Motivation

\$600,000 Annually
Missed Revenue for
20,000 Missed Items

\$100,630 Annually
Lost Value for
15,356 Expired Items

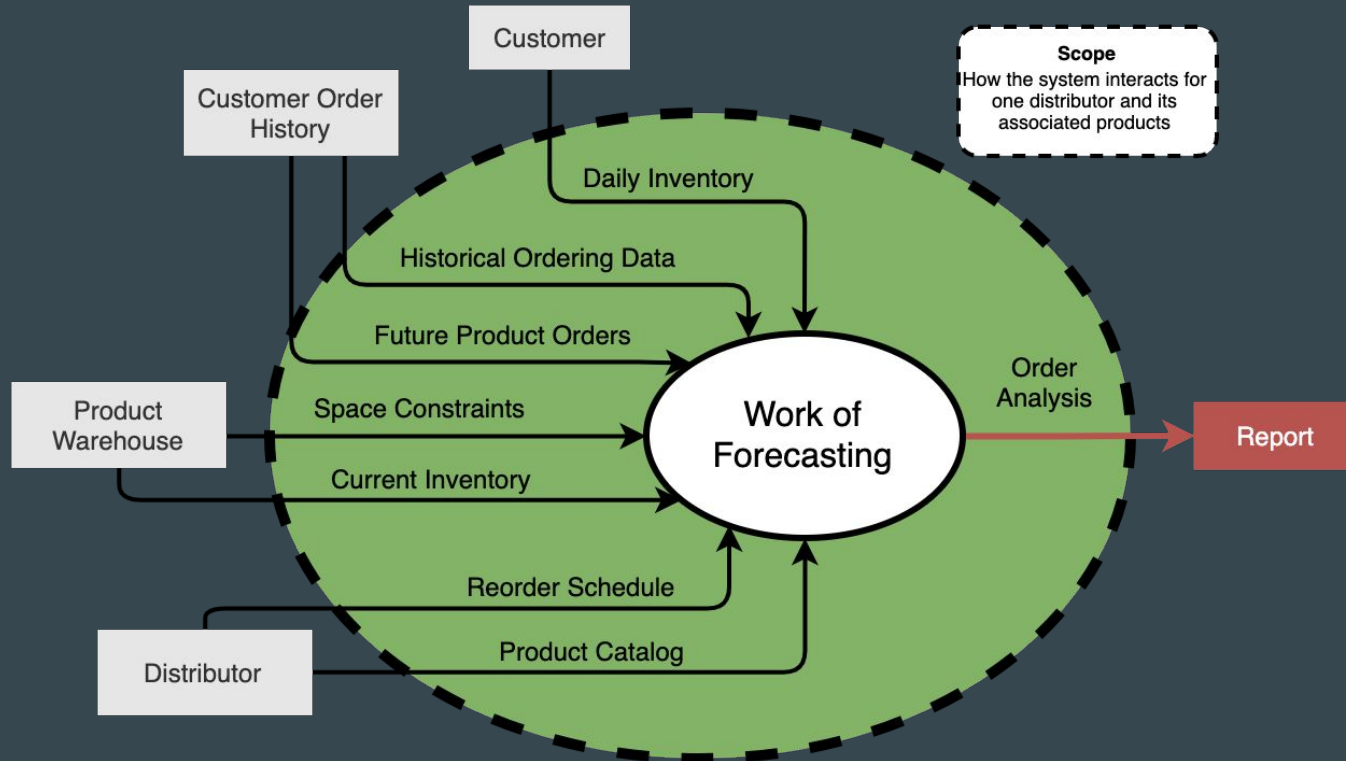
3 Full-Time Employees
Dedicating
50% of Time to Ordering

Project Vision

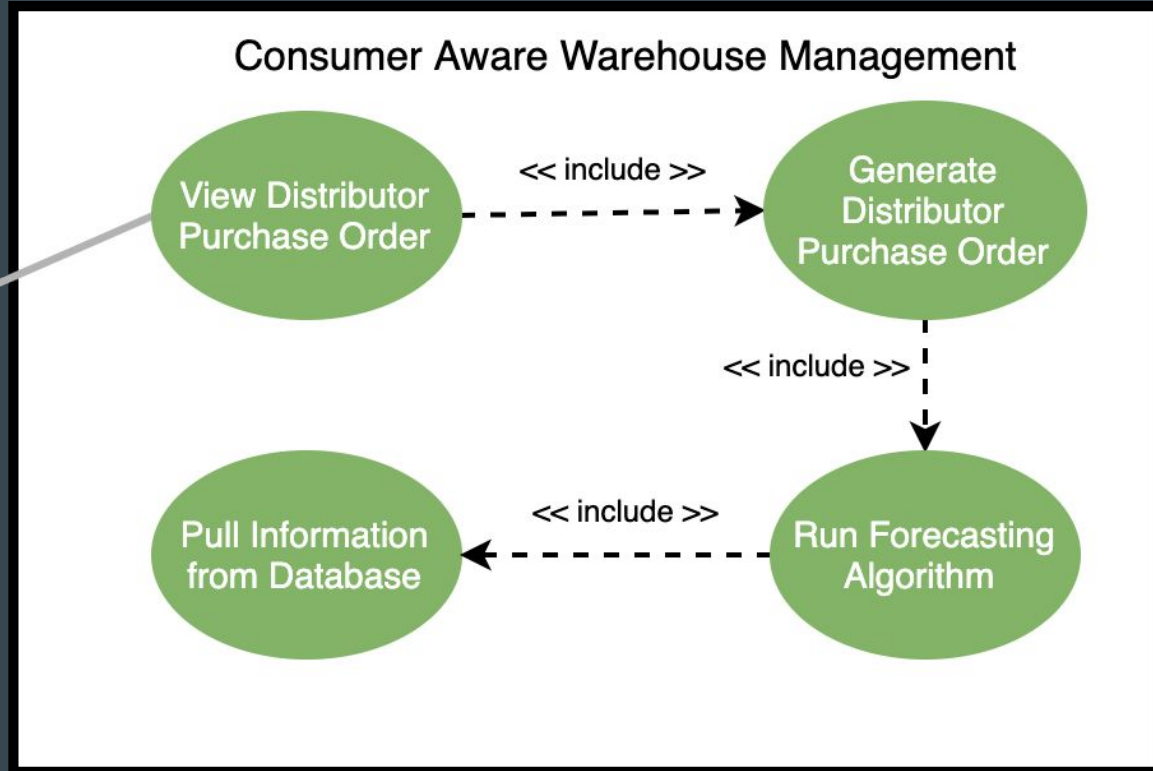
Crafty desires a forecasting algorithm for inventory management that automates reordering for warehouse stock



Conceptual Sketch



Conceptual Design Diagram - Use Case Diagram



Functional Requirements

**Take Input
From Crafty
Database for
Distributor
Purchase Order**

DB Format

**Predict Optimal
Product Orders**

Order History, Stock, Space, +

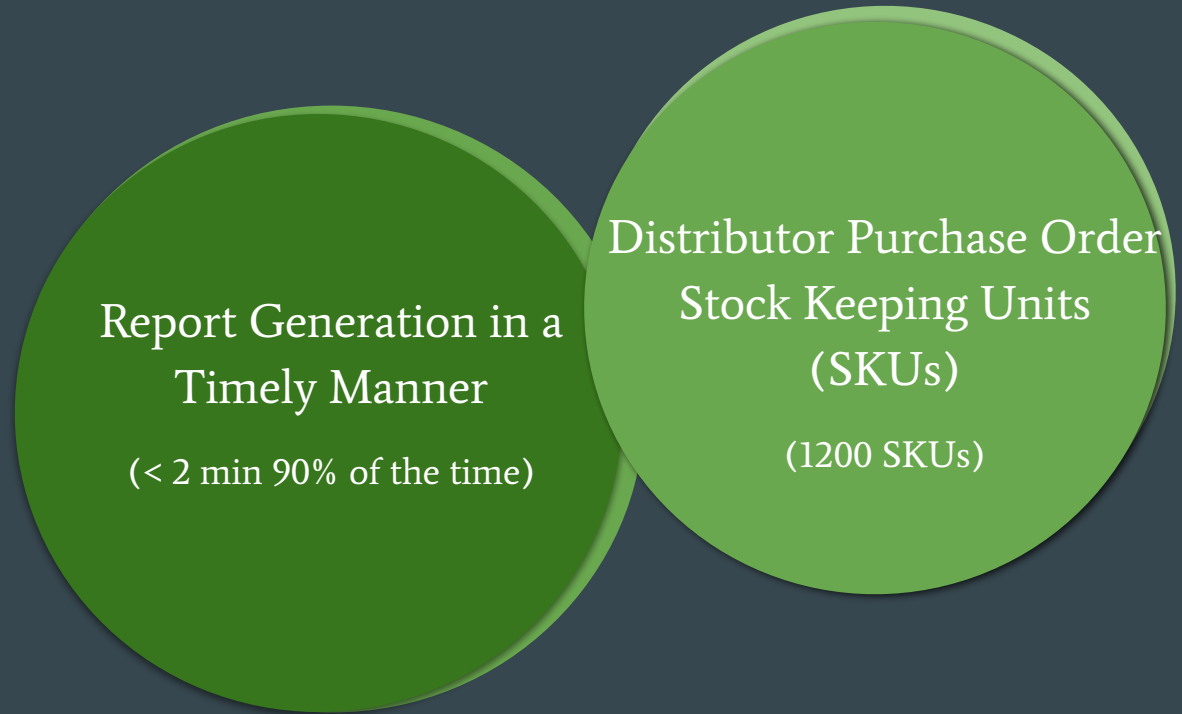
**Consider
Future Product
Needs**

Events and New
Clients

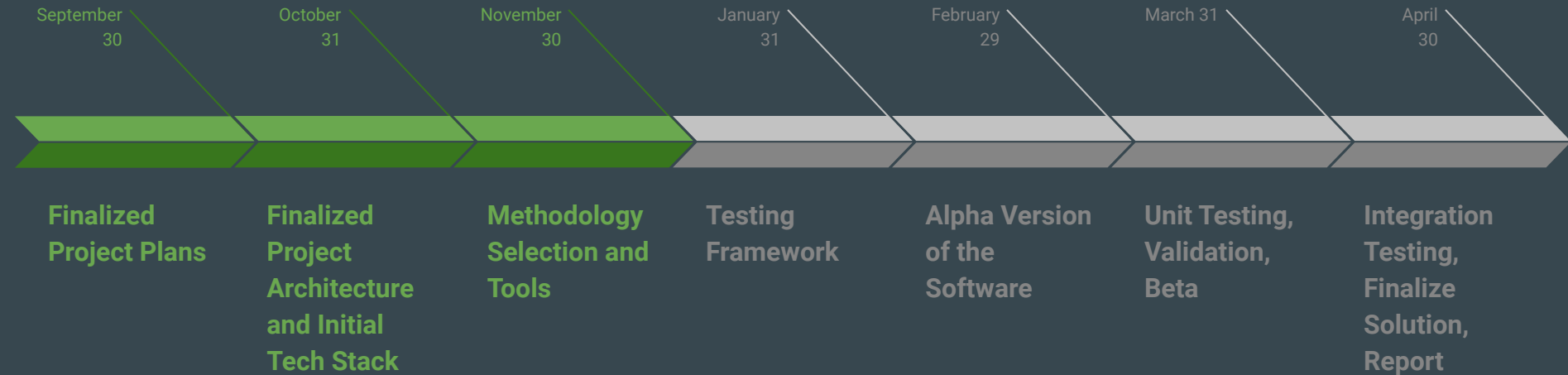
**Create User
Interface for
Modification of
Product Orders**

Manual Adjustments and View

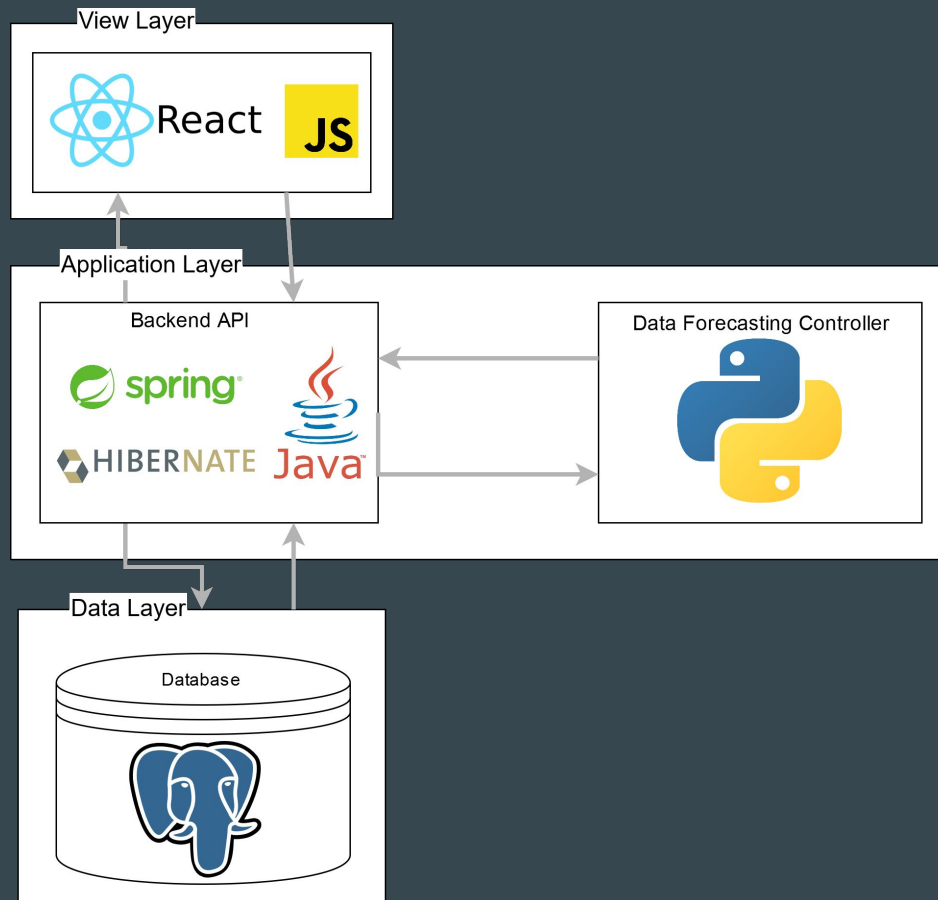
Non-Functional Requirements



Project Plan - Schedule / Milestones



System Design



Project Plan - Tasks



Project Plan - Risks

Inaccurate results

Results not clearly understood

Steep learning curve

| | | Impact | | |
|------------|---------------|--------|----------|--------|
| | | Minor | Moderate | Severe |
| Likelihood | Very Likely | Medium | High | High |
| | Likely | Low | High | High |
| | Possible | Low | Medium | High |
| | Unlikely | Low | Medium | Medium |
| | Very Unlikely | Low | Medium | Medium |
| | | | | |

Project Plan - Progress Metrics

The image displays a Kanban board with four columns: Open, To Do, Doing, and Closed. Each column contains task cards with titles, IDs, dates, and status tags.

| Column | Task ID | Task Title | Category | Date | Status |
|--------|---------|---|--|--------------|---------------------------|
| Open | #10 | Design Document: Rev 2 | 8 of 10 tasks completed | Nov 1, 2019 | Doing, course deliverable |
| Open | #8 | Create Fake JSON | Create Static Table Component | Nov 15 | Frontend |
| Open | #7 | Define Initial Endpoints | Round Trip Table Data | Nov 15 | Frontend, backend |
| Open | #6 | Host Basic Website | Initialize Testing Framework for Table | Nov 22 | Frontend |
| Open | #5 | Initialize the spring backend | Make Table Dynamic (Editable Fields) | Nov 15 | Frontend |
| Open | #14 | Create Component/Module Diagram | | Jan 31, 2020 | |
| Open | #15 | Make Selector Component | | Nov 20 | Frontend |
| To Do | #23 | Secure http://sdmay20-25.ece.iastate.edu/ with HTTP | | | |
| Doing | #22 | Get an SSL Certificate on the Server | | Nov 16 | |
| Closed | #1 | Reflection: Areas of Professional Responsibility | course deliverable | Oct 18 | |
| Closed | #2 | Weekly Report 2 | course deliverable | Oct 20 | |
| Closed | #3 | Weekly Report 3 | course deliverable | Nov 11 | |
| Closed | #4 | Weekly Report 4 | course deliverable | Nov 11 | |
| Closed | #5 | Initialize the spring backend | Doing, backend | | |
| Closed | #10 | Design Document: Rev 2 | Doing, course deliverable | Nov 1 | |

Crafty's System

CRAFTY

Account/Company
Product
Order

Logout

Procurement Management

← back
Procurement Tool
Distributor Order List
Placed Order List

1
 Region
 Chicago

2
 Distributor
 CHI - Costco - Business

3

85 **Costco - Business**

Order Method: Email, procurement@craftydelivers.com, w580mkm@costco.com, w580mkm04@costco.com, w580mkm03@costco.com, w580mkm10@costco.com, 7300 S Cicero Ave, Bedford Park, IL 60629

Active: M, W, Th
Order Due @: 2:30 PM

Order Minimum: \$229.44 / \$ 250.00 Term: 4 Buffer: 1.4 x

| Distributor Product ID External ID | Cost Price | Product Info | Reorder Threshold Units | Order Up To Units | OH Inventory (Base Units) | On Hand Units En Route | Amount Needed | Amount To Order | Order Spend | Missed Item Count | Order Stats |
|---|----------------------|--|-------------------------|-------------------|---------------------------|------------------------|---------------|-----------------|-------------|-------------------|-------------|
| <input type="checkbox"/> 21681 212858 | \$ 6.29 \$ 9.99 | Extra Fancy Long Grain White Rice C&F Foods 10 lb bag | 1.0 | 3.0 | 1 (1) | 0 | 2 | 2 | \$ 12.58 | 0 | ? |
| <input type="checkbox"/> 13993 921389 | \$ 14.09 \$ 21.99 | Smart Zip Quart Freezer Bag Ziploc 216 - 1 qt bags | 1.0 | 2.0 | 1 (1) | 0 | 1 | 1 | \$ 14.09 | 0 | ? |
| <input type="checkbox"/> 32145 1335941 | \$ 14.49 \$ 22.50 | Variety Pack Hubert's Lemonade 12 - 16 oz bottles | 2.0 | 5.0 | 2 (2) | 0 | 3 | 3 | \$ 43.47 | 0 | ? |
| <input type="checkbox"/> 7840 1079506 | \$ 13.65 \$ 19.99 | Dried Mango Paradise Green 35.2 oz bag | 2.0 | 4.0 | 1 (1) | 0 | 3 | 3 | \$ 40.95 | 0 | ? |
| <input type="checkbox"/> 7870 516452 | \$ 9.89 \$ 14.99 | Mini Moo's Half & Half Creamer Cups Land O'Lakes 192 - 0.3 oz cups | 2.0 | 3.0 | 2 (2) | 0 | 1 | 1 | \$ 9.89 | 0 | ? |
| <input type="checkbox"/> 7949 95956 | \$ 15.89 \$ 28.00 | Peanut Butter M&M's M&M'S 24 - 1.6 oz bags | 3.0 | 5.0 | 3 (3) | 0 | 2 | 2 | \$ 31.78 | 0 | ? |

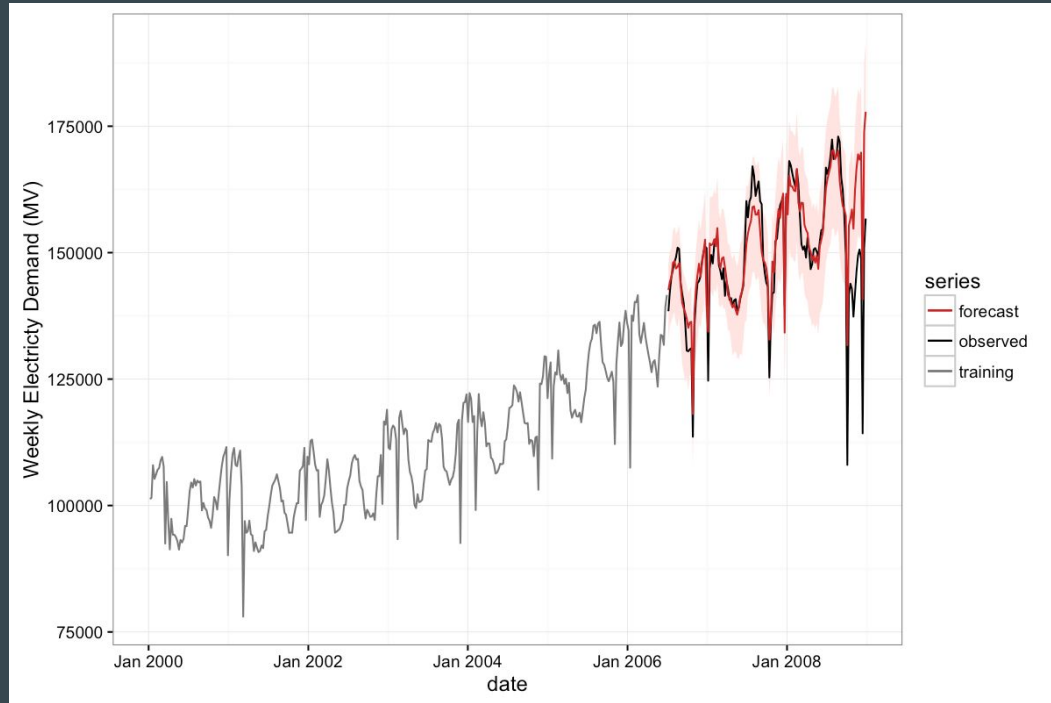
4

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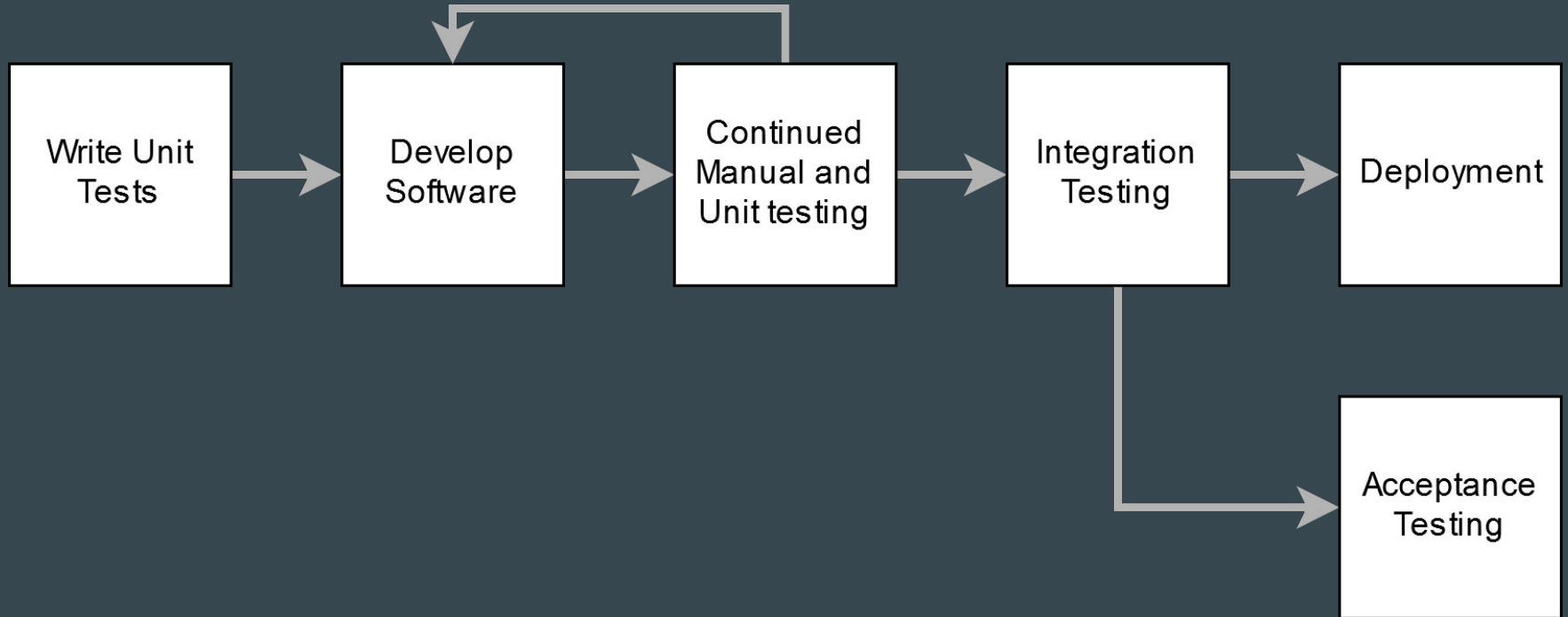
Prototype Implementations



Algorithm Approaches



Test Plan



Test Plan

Acceptance Testing

These factors help us identify how well the solution is performing

Demonstrate to the Client

Show Crafty incremental progress on the app

Validate Algorithm Reasoning

Check reasoning algorithm provides for decisions

Verify Predictions Against Human Orders

Compare what a human would have ordered with the same information

Perform Predictions on Past Time Frames

Split data into learning and evaluation sets



Project Roadmap

Accomplishments

- Planning
 - Requirements Elicitation
 - Initial Research
 - Project Plan
- Proof of Concept
 - Frontend
 - Backend
 - Querying Crafty's Database

Future Plans

- Development
- Testing
- Prototyping
- Continue Research
- Talk to Client

Thank you!

Questions?

Existing Approaches 1 (Learning Based Approach)

- Input Variables
 - Past Sales
 - Weather
 - Travel Time of Product
- Advantages
 - Better Prediction of Demand
 - Lowers Missed Sales
- Disadvantages
 - Amount of Resources
- Relation to Our Solution
 - Past Sales Data
 - Shipping Time
- Differentiation From Our Solution
 - Too Many Input Variables

Existing Approaches 2 (Regression Based Approach)

- Input Variables
 - Past Sales
 - Seasonal Changes
- Advantages
 - Little Amount of Resources
- Disadvantages
 - Can't Handle Spikes in Demand
 - Doesn't Figure in Shipping Time
- Relation to Our Solution
 - Past Sales Data
- Differentiation From Our Solution
 - Doesn't Figure in Shipping Time

TODO: Slides to add after the pres for qna

- Omair: Gantt chart, Tasks for semester 2, an image of the iterative process

Distributor Order List

CRAFTY

Account/Company Product Order

Logout

Procurement Management


[← back](#)

Procurement Tool **Distributor Order List** Placed Order List

Order Day: **Saturday**

Search:

| Place Order | Distributor | Region | Order Days | Order Due Time | Purchaser | Order Method | Ignore | Order Created? |
|-------------|-------------------------|--------|------------------------|----------------|---------------|--------------|--------------------------|----------------|
| | Amazon | CHI | M, T, W, Th, F, Sa, Su | 12:00 PM | Jessica Huang | Online | <input type="checkbox"/> | |
| | Samantha's Event Linens | CHI | M, T, W, Th, F, Sa, Su | | Jessica Huang | Email | <input type="checkbox"/> | |
| | 415 Catering | SF | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |
| | Cheffield Events | CHI | M, T, W, Th, F, Sa, Su | | Kevin Binder | Email | <input type="checkbox"/> | |
| | Aloha Poke | CHI | M, T, W, Th, F, Sa, Su | | | Email | <input type="checkbox"/> | |
| | Crafty | SF | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |
| | Herbs & Spices Catering | SF | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |
| | DOUGH XX | SF | M, T, W, Th, F, Sa, Su | | Jessica Huang | | <input type="checkbox"/> | |
| | Just Salad | CHI | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |
| | Protein Bar & Kitchen | CHI | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |
| | Safeway - Oakland | SF | M, T, W, Th, F, Sa, Su | | Jessica Huang | Online | <input type="checkbox"/> | |
| | 121 Catering | CHI | M, T, W, Th, F, Sa, Su | | | | <input type="checkbox"/> | |



Implementation

| | | Chicago | | | | | Bartend Chicago | | | | |
|--------------------------------|----------|---------------------------------------|--------------------------------|--------------------------------|---------------------------|------------------------|-----------------|--------------------------------|-------------|-------------------|------------------------------------|
| 12 | | Bartend Chicago | | | | | Order Minimum | | Term | Buffer | |
| | | Order Method: Active: M, T, W, TH, F, | | | | | | | | | |
| | | Address: Order Due: | | | | | | | | | |
| Distributor | Cost | Product Info | Reorder Threshold Units | Order Up To Units | OH Inventory (Base Units) | On Hand Units En Route | \$/\$1 | | | 1 x | |
| ProductID | --- | | | | | | Amount Needed | Amount To Order | Order Spend | Missed Item Count | Order Stats |
| --- | Price | | | | | | | | | | |
| ExernalID | | | | | | | | | | | |
| <input type="checkbox"/> 21681 | \$ 6.29 | Extra Fancy Long Grain White Rice | <input type="text" value="1"/> | <input type="text" value="3"/> | 1(1) | 0 | 2 | <input type="text" value="2"/> | \$12.58 | 0 | ⓘ |
| 212858 | \$ 9.99 | | | | | | | | | | |
| <input type="checkbox"/> 13993 | \$ 14.09 | Smart Zip Quart Freezer Bag | <input type="text" value="1"/> | <input type="text" value="2"/> | 1(1) | 0 | 1 | <input type="text" value="1"/> | \$14.09 | 0 | ⓘ |
| 921389 | \$ 21.99 | | | | | | | | | | |

