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FACULTY OF ENGINEERING
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Improving Data Management Practices & Production Efficiency at PieceMeal

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PIECEMEAL
FOOD PROVISIONS
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DAVIS PIER

1 Background

PieceMeal is a **socially conscious meal kit distribution service** established by **Kara Friesen** with the goal of making **locally sourced**, **farm-fresh** food **accessible** to everyone.

Founder Kara Friesen posing with a mealkit

2 Problem Statement & Objectives

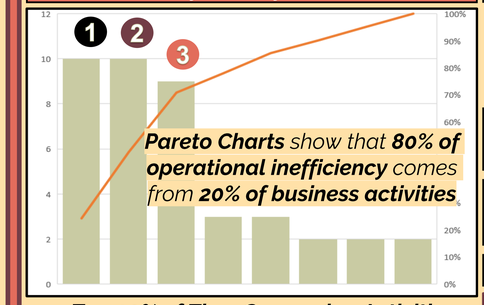
PieceMeal needs to **systematize** & **streamline** its **operations** to enable:

1. Founder Kara Friesen to allocate more time from **running day-to-day business operations** towards **long-term strategic visioning & planning**
2. **Capacity** to meet **increased demand**

Sample Produce at PieceMeal

3 Project Scope

Current Weekly Activity Time Distribution



Top 20% of Time Consuming Activities

1. Data Entry & Manual Calculations
2. Marketing
3. Packaging

Decision Matrix Analysis

*A **Decision Matrix** was used to identify the **highest priority operational inefficiencies** by **assigning scores** to each **option** based on a list of **weighted factors**.*

Time Savings Potential	Organizational Importance	Solution Generalizability
Technical Complexity	Scale Sensitivity	Costliness

Finalized Project Scope

Data & Inventory Management

Production Efficiency

4 Solution 1.1 – Data & Inventory Management

Old Data Management System

10 HOURS /WEEK Time spent on data entry, manual calculations and information management

Inventory is managed on phone and conversions between vendor and recipe units are managed manually

Recipes and related data are stored on "Food Cost Profiler"

All PieceMeal operational data is manually synced to and stored on Excel

New Data Management System

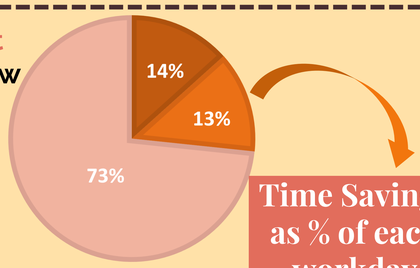
6 HOURS /WEEK Time spent has been reduced by 4 hours per week

Achieved $300 in savings from mistakes prevented

$300/ month

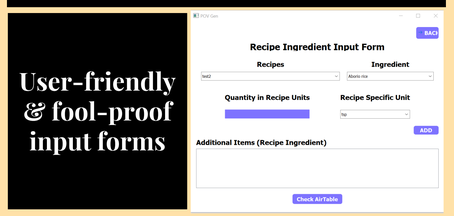
Airtable is a cloud-based spreadsheet & database hybrid application that now stores all PieceMeal operational data

A Graphical User Interface (GUI) custom-built on Python provides a new medium to input and modify all operational data



Notable Features

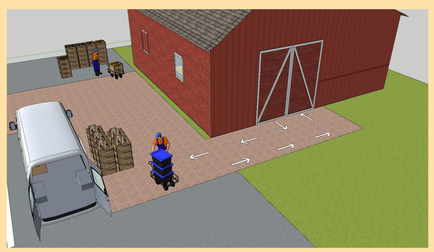
- Email notifications for low inventory
- Cost-tracking feature for each ingredient & supplier
- Pre-calculated unit conversions
- User-friendly & fool-proof input forms



5 Solution 2 – Production Efficiency

Data Collection Methods	Data Analysis Methods
Time Studies	MOST **(Maynard Operation Sequence Technique)**
Contextual Inquiry	

Original State	Future State
UNLOADING - 10 min.	Process Improvements in **Warehousing, Labelling, Lists, & Orders of Operations** have resulted in an **overall:**
PACKING - 30 min/5 boxes	**8 HRS/WEEK TIME SAVINGS**
LOADING - 5 min.	



6 Solution 1.2 – Mixed Integer Linear Programming (MILP) Model

i = *ingredient index*
j = *recipe index*
I = *ingredients*
R = *recipes*
X_j = *Binary variable indicating whether recipe j is selected*
q_{ij} = *quantity of ingredient i in one serving* of recipe j*
c_{ij} = *price of ingredient i in one serving* of recipe j*
B_i = *Quantity in inventory of ingredient i*
D = *demand; number of customers for the current period*
k_i = *penalty for using buying new ingredients*
δ_i^+ = *the quantity of ingredients to buy*
δ_i^- = *the quantity of surplus (unused) inventory*

$$\text{minimize} \sum_{i \in \mathcal{I}} \sum_{j \in \mathcal{J}} c_{ij} \cdot x_j + \sum_{i \in \mathcal{I}} K_i \cdot \delta_i^+$$

Subject to:

$$\sum_{j=1}^{N} X_j = 3$$

$$\sum_{j=1}^{N} D * (q_{ij} * X_j) = Bi + \delta_i{}^+ - \delta_i{}^- \qquad \forall i = 1, \ldots, N$$

$$X_j \in \{0,1\}$$

Goal: Select 3 recipes that minimize ingredients costs to the business

Constraint 1: total of 3 recipes must be selected due to operational model

Constraint 2: total quantity is equal to the on-hand inventory plus the additional procurement minus leftover

Constraint 3: x values are binary (0 or 1)