SOD Assignment 1: Revisited

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Contents

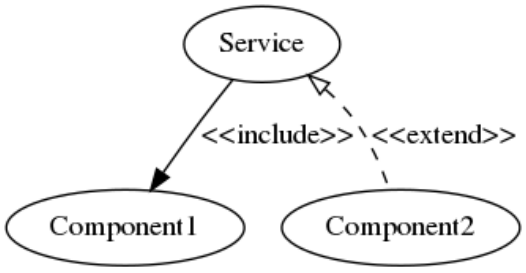
1 TODO Introduction

1.1 Purpose

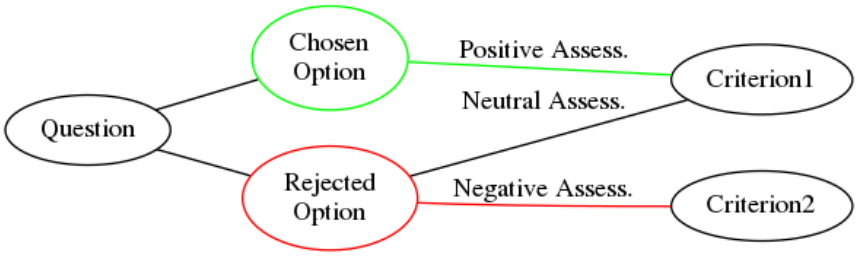
This document presents a design aimed at reducing waste, caused by a university cafeteria over-producing food, by using a pre-ordering service along with historical analysis to provide accurate short-term demand estimates as well as insight into overall trends.

1.2 TODO Assumptions

1.3 TODO Terminology



Template for Service Decomposition



Template for QOC Diagram

2 DONE Business Domain

2.1 DONE Usage Scenarios

2.1.1 Student Case

Frank and Giorgia are sitting in class taking notes on their laptops. They want to eat at the Cafeteria before their next lecture. The University Cafeteria has a wide variety of food available, and Frank is hungry so he looks up the Cafeteria's menu and decides to get fish and chips with a side of salad. Giorgia does the same, but also places an order and schedules to pick it up in thirty minutes.

Frank and Giorgia leave class and go the Cafeteria. When they arrive Frank looks around for his desired meal, but does not see it. Another batch of fish and chips is being made and he'll have to wait or choose something else.

Giorgia instead goes to a kiosk labeled "Pick-up" and tells the clerk her name and order number. The clerk fetches her meal, and she goes to pay the cashier.

2.1.2 Cafeteria Case

At the beginning of a new day cooks in the Cafeteria begin preparing that day's meals. This is the core menu.

They also prepare some meals that have already been ordered for the morning. Which are placed in temporary storage, organized for quick retrieval and preserved to keep the hot and cold items fresh. Students come and go picking up their orders, or taking time choosing a meal. Some

The kitchen notices that a particular item is selling less than usual and by the end of the day there looks to be an excess amount of waste. The kitchen signals to the computer system that it should promote this item in

some way. Either through a banner in the app, placing the item nearer to the top of the menu, putting on a token sale of the item, or whatever other promotional method.

At the end of the month the kitchen notices that some items were unpopular based off of the sales statistics. The kitchen then decides that they will take those items off the menu, or make less for the next month.

2.2 DONE Participants

2.2.1 Stakeholders

1. **University**

   The University is a service provider and will provide a preordering service for students and a notification service for the Cafeteria, informing it of students' orders. As a part of the preorder service, the University will also consume the services of a Digital Bank.

   Additionally the University will be recording transactions made through the preorder service (and those made without it) so that the data may later be analyzed.

2. **Digital Bank**

   A Digital Bank provides a digital payment service, processing pre-order payments made Students that intend to pay at the time of pre-ordering.

2.2.2 Users

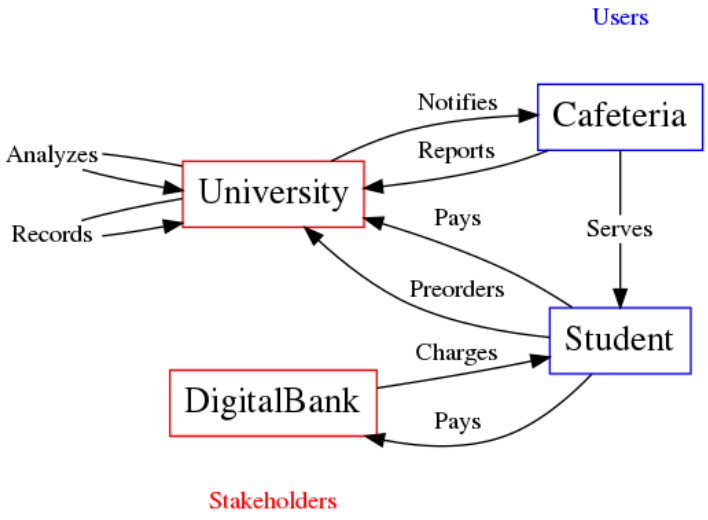
1. **Cafeteria**

   The Cafeteria serves food to Students, receiving orders directly from a student or indirectly via the University's preorder/notification service. The Cafeteria will also report sales and unsold product. The Cafeteria produces the supply.

2. **Students**

   A Student of the University is a customer of the Cafeteria. Students are the entities which generate demand.

2.3 Model



Business Domain Model

2.4 Conceptual Services

This section contains a list of every service that could be related to the operation of the proposed system. In it are both software and non-software services, we will describe the details of some of the former and assume the latter will be provided by other entities.

Preorder Service **HYBRID**

The service by which Students can communicate their demand ahead of time.

- **Authorization Service** UTILITY

  Provided by the University for the Students, Cafeteria, and University Administrators. Serves as a secure gateway for accessing software components of the system.

  - Registration Service UTILITY
  - Login Service UTILITY

- **Online Ordering Service** HYBRID

  Provided by the University for the Students. An internet gateway Students use to interact with the system.

  - (Menu) Viewing Service ENTITY
  - Shopping Cart Service ENTITY
  - Scheduling Service TASK

- **Notification Service** TASK

  Provided by the University to the Cafeteria. Informs the Cafeteria of what orders have been placed, the contents of the order and the desired pickup time.

- **Digital Payment Service** UTILITY

  Provided by the Digital Bank stakeholder, if the Student wishes to pay at the time of preordering, they are transferred to the Digital Bank's service in order to complete the payment.

- **Food Service** TASK

  Non-software service provided the Cafeteria, performing manual labor required to complete orders.

  - Food Preparation Service TASK
    Fulfillment of Student orders.
  - Order Validation Service TASK
    Matching of a Student to their order at pickup.
  - Food Fetching Service TASK
    Retrieval of a Student's order at pickup.

Prediction Service **HYBRID**

The service by which a prediction of demand in the short and long term is made.

- **Analysis Service** ENTITY

  Owned by the University. Analyzes collected data in order to develop a model for future demand.

- **Monitor Service** TASK

  Owned by the University. Records orders made through the preorder service or collects data regarding the other sales made at the Cafeteria.

  - Reporting Service UTILITY

    Provided for the Cafeteria by the University. The Cafeteria reports sales made, preorders fulfilled, and excess production.

- **Data Storage Service** TASK

  The data the University collects on orders needs to be stored somewhere, whether this is done on an owned asset or if though a service provided by another stakeholder.

- **(Data) Viewing Service** ENTITY

  The data which has been stored must be accessible for the University to perform analysis.

Menu Changing Service **TASK**

The Cafeteria has to be able to change the menu from week to week, or over whatever time period the menu changes.

View Service **ENTITY**

3 Functional Requirements

In this section we list some of the functional requirements that our services, as they are described, must fulfill. They have been derived from the services outlined in the Conceptual Services section. The format is:

- **ID :** ***Name***

  Short Description

For our purposes we will select functional requirements most relevant to the problem of accurately predicting demand. To this end we will be concerned with FR-01 (*Placing Orders*), FR-04 (*Record Transactions*), and FR-08 (*Trend Analysis*). These three functions form a skeleton of the proposed service: when a Student places an order, that data is collected by the University and saved for future analysis. This means we will neglecting the Digital Bank stakeholder, and perhaps only touching the actions of the Cafeteria. The other functionalities listed are necessary but peripheral to the core intent of this proposal.

Requirements

*** FR-01 :** ***Placing Orders***

A Student must be able to place an order without being physically present at the Cafeteria

FR-02 : ***Schedule Pickup***

As an order is placed, the Student should also be able to specify a time they wish to obtain their order.

FR-03 : ***Electronic Payment***

A Student should be able to optionally pay at the time of placing their order.

*** FR-04 :** ***Record Transactions***

Each transaction made must be recorded.

FR-05 : ***Send Transactions Records***

If a transaction is not made through the preorder system, the Cafeteria must still report it to the University.

FR-06 : ***Send Cafeteria Orders***

There must be a system in place so that the Cafeteria receives preorders as soon as possible.

FR-07 : ***Authorization***

The system must be properly secured so that users of the system may register, log in, and perform whatever actions that particular user is permitted and no others.

*** FR-08 :** ***Trend Analysis***

The system must have some way of extrapolating demand based on the number of preorders, correlated with historical data.

All this and more...

4 Quality Requirements

This section will discuss the most important qualities in considering the problem of more accurately predicting and meeting demand. For clarity we will use standard[1] definitions.

4.1 QR-01 : *Security*

Definition degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization

We choose security because adoption of the system is predicated on security. If the system is not secure and leaks important information, or is otherwise compromised, trust in the system will diminish to nothing. Any security faults regarding the online payment process would be especially deleterious.

4.2 QR-02 : *Availability*

Definition degree to which a system, product or component is operational and accessible when required for use

The system must be reliably available to users on campus and off, with as little down-time as possible. The end users rely on the preorder service to order food ahead of time, and the University relies on it to develop a model for demand.

4.3 QR-03 : *Usability*

Definition degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

The students will want to be able to use the services quickly and easily, because they only need to browse through the menu and place an order, regardless of the device. If the service is too complex to use they will not make pre-ordering a habit which contradicts our goal of changing Student behavior to thinking ahead about what they should eat.

[1] ISO/IEC 25010:2011

Users of the system on the side of the Cafeteria should also have an easy time navigating it. A minimal requirement of knowledge should be required to use it and a minimal number of actions required to operate it.

5 Business Services

5.1 BS-01 : *Transaction Recording*

5.1.1 Involved Participants

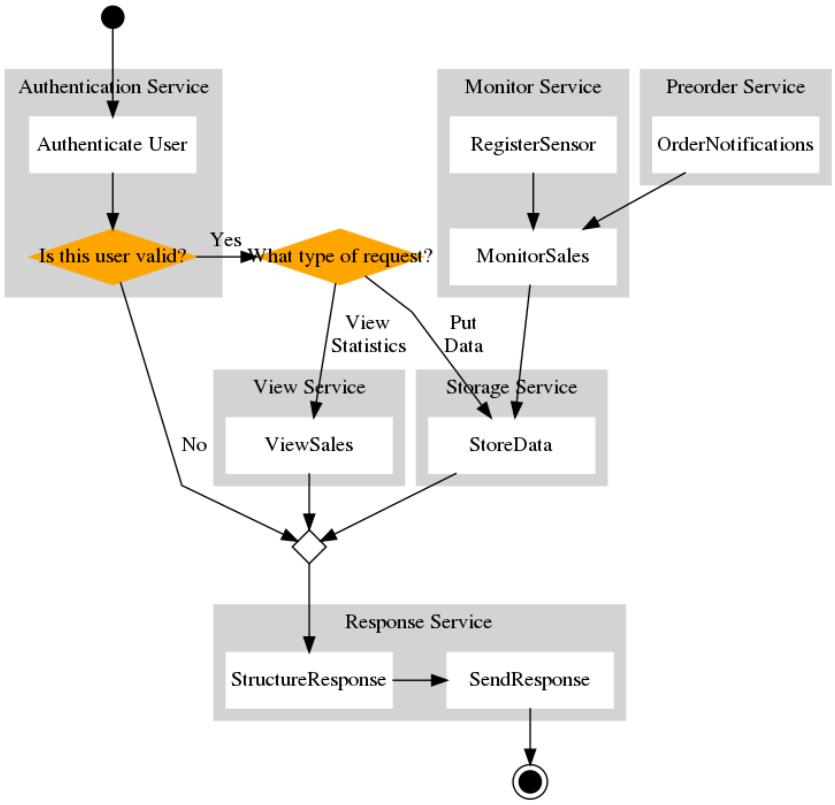
University Cafeteria

5.1.2 TODO Detailed Operational Description

This service operates as a log for tracking the transaction history of the system, recording both transactions made at the Cafeteria and through the Preorder Service. The Transaction Recording Service also manages the transactions for meals ordered locally or pre-ordered, upon payment, and allows the staff to retrieve and verify the transaction log. These records will also be used by the "Statistical Analysis Service" to generate statistics.

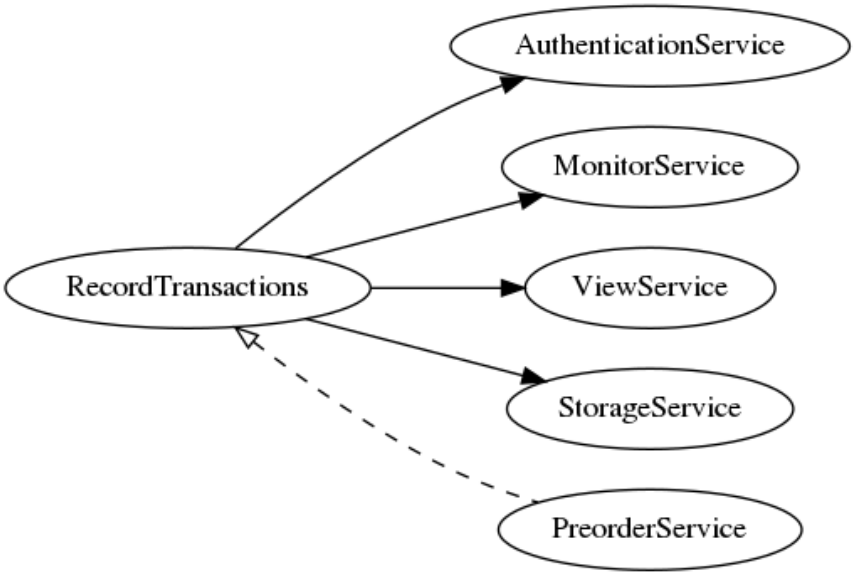
5.1.3 Service Behavior

In this first activity diagram we will be more explicit about each service involved, but we will abstract some (Authentication and Response) away to simplify the other activity diagrams.



BS-01 (Statistical Analysis) Activity Diagram

5.1.4 Service Decomposition



BS-01 (Transaction Recording) Service Decomposition

5.2 BS-02 : *Statistical Analysis*

5.2.1 TODO Involved Participants

University

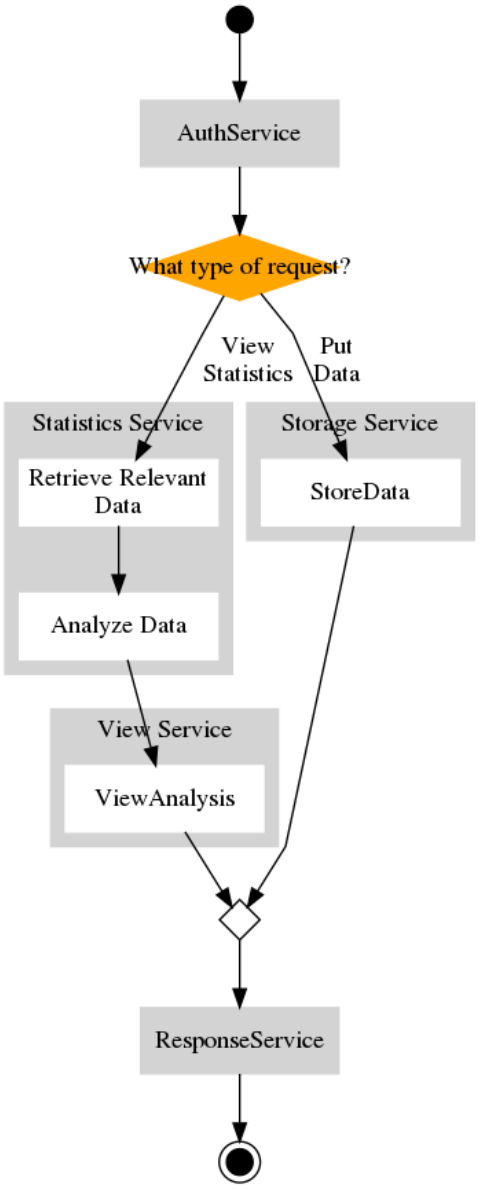
5.2.2 TODO Detailed Operational Description

After successful login, the administrator can use the Statistics Options. They can view statistical data during some timeline or insert how much food waste in kg was measured for a specific time period by the cafeteria staff. Whatever their choice, the request is sent and handled by the Statistical Analysis Service.

The Service initially asks for login credentials. If the credentials are valid, it identifies whether the user asks for statistical data or wishes to store new information. If they want to view an analysis, the relevant information is retrieved and analyzed and view data is produced, that corresponds to the graphs or other views that will display this analysis. On the other hand, the information about the weight measurement is stored.

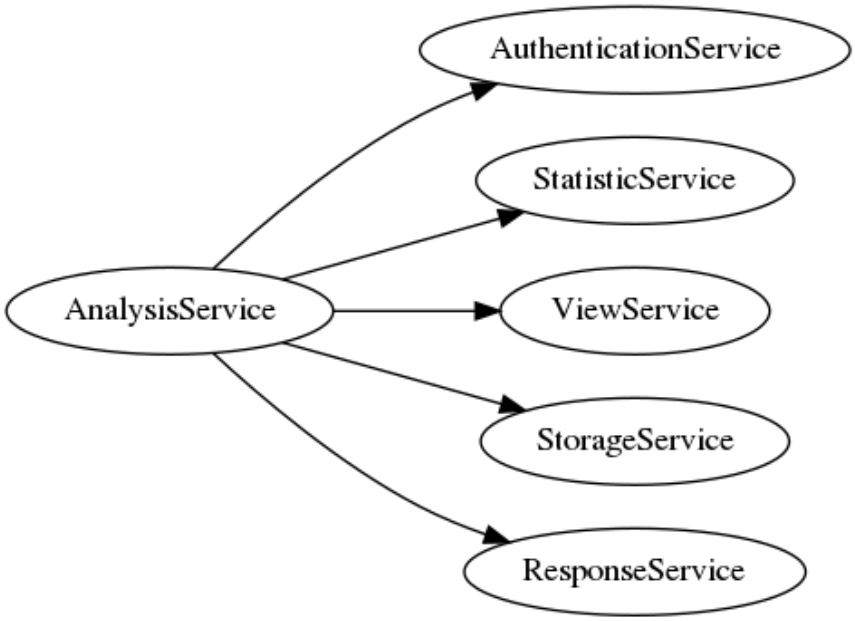
This Service does not deal with registering new administrators in the system. This could be handled by another service, as it requires information and actions irrelevant with the statistical analysis.

5.2.3 DONE Service Behavior



BS-02 (Statistical Analysis) Activity Diagram

5.2.4 DONE Service Candidates Decomposition



BS-02 (Statistical Analysis) Service Decomposition

5.3 BS-03 : *Preordering*

5.3.1 DONE Involved Participants

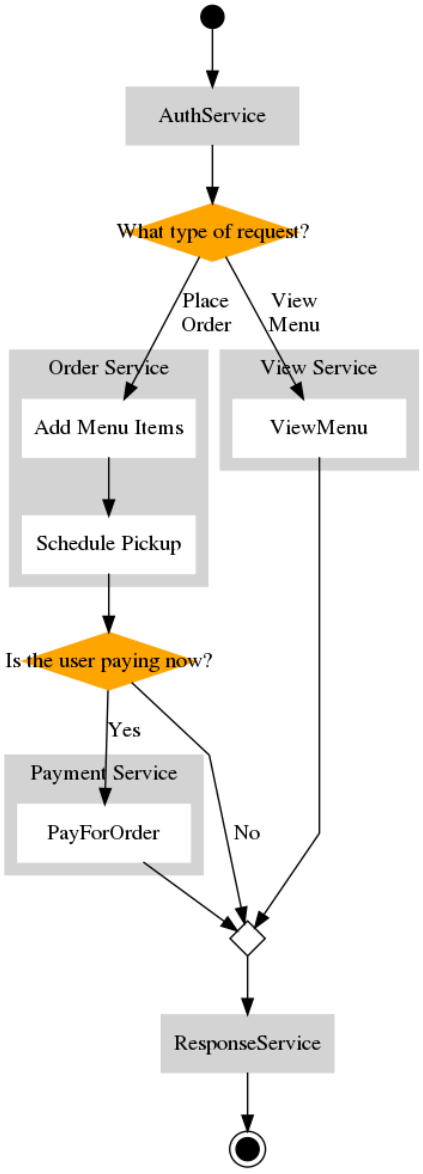
Students University Digital Bank

5.3.2 TODO Detailed Operational Description

A Student may order food from the Cafeteria ahead of arriving. This may be done through an web or a phone app which serves as the Student's interface to the system. An authorized user logs in, and is presented with the home screen, presenting whatever new information about menu items or new deal that the administrators want.

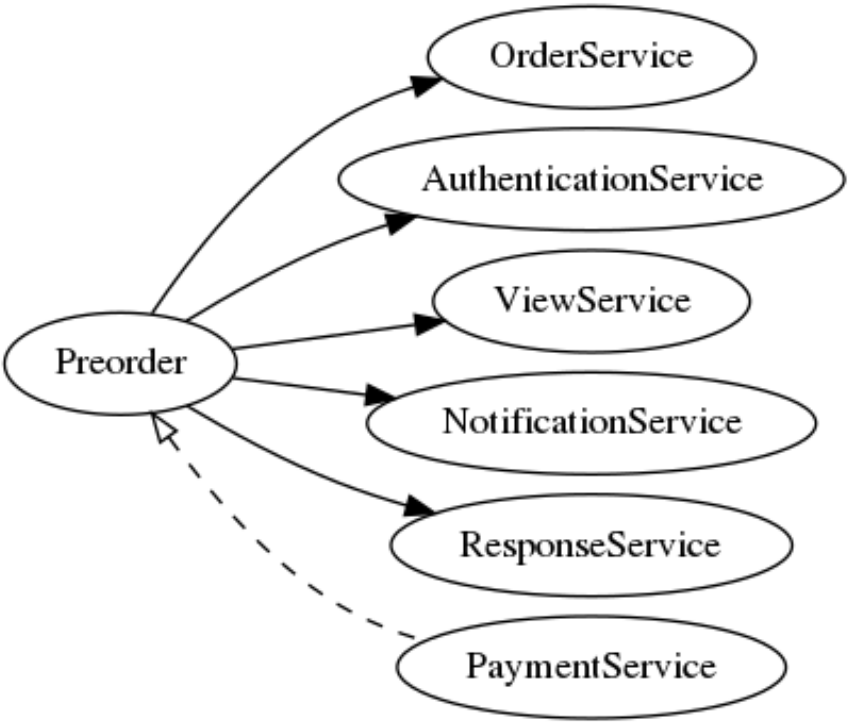
From the home screen the user can log out, view the menu, or view their past orders. The user may repeat or edit an order from their history, or fill out a new order from the menu. After completing an order the user schedules a time to pick up their order and receives a number to give the cashier. In finalizing the order the Student may also choose to pay online or at the time of pickup.

5.3.3 DONE Service Behavior



BS-03 (Preorder) Activity Diagram

5.3.4 DONE Service Decomposition



BS-03 (Preordering) Service Decomposition

6 Design Space

AK-SPAM 1

Concern

Con#1 How can the user be encouraged to use the pre-ordering system? Are there any barriers or concerns that the customer or business would have that would make them not want to use it, undercutting the primary goal of reducing waste via this system?

Criteria

Cr#1 Security

Cr#2 Availability

Cr#3 Usability

Options

- Trusted Third Party Payment

  ID Con#1-Opt#1

  Description Pre-order payment should be done through a trusted and known third party with experience so the process is secure.

  Status Decided

  Relationship(s) none

  Evaluation —

  - Cr#1 — This option is secure as long as the third party maintains integrity. While we have a less control over the security of the system, a third-party payment processing company's business is predicated on security, so we assess this positively.
  - Cr#2 — This option's availability depends again on the third party, it is partially out of our control, depending on the service model of the third party.
  - Cr#3 — This option should have positive usability, especially if it is through an already common service that Students already use.

Rationale Given that the third-party processing company is of repute, this option should have the best security, availability, and usability. The same functionality is achieved as implementing it in-house but with a slight recurring cost.

- Payment on Pickup

  ID Con#1-Opt#2

  Description There is no online payment system, the customer pays for items upon receipt.

  Status Rejected

  Relationship(s) none

  Evaluation —

  - Cr#1 — This option is as secure as the Cafeteria itself. No additional attack vectors are added to the existing infrastructure.
  - Cr#2 — The rest of the system may still have high availability, but payment is only available when at the Cafeteria, so this option has a negative effect on availability.
  - Cr#3 — This option does nothing to improve usability, it does not enable Students to complete payment more than without the system so we assess this as negative in the usability dimension.

  Rationale No significant functionality is added, nor are the qualities we listed improved by Payment on Pickup, so we reject this option

- In-house Payment System

  ID Con#1-Opt#3

  Description Online payment is done via a system we've implemented

  Status Rejected

  Relationship(s) none

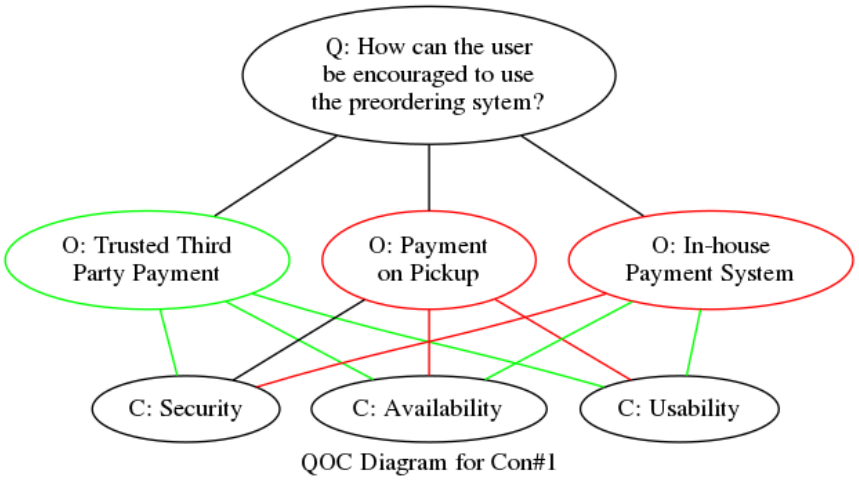
  Evaluation —

  - Cr#1 — This option has implications for security. Implementing a payment handling system creates a dangerous potential attack vector and lost trust is hard to regain.
  - Cr#2 — This option could be more or less reliable than Con#1-Opt#1 depending on the quality and architecture of the implementation.

– Cr#3 — This option could be integrated into our solutions even more than Con#1-Opt#1 because of its in-house nature and provide a better user experience.

Rationale The option is strongly depends on the quality of the developed in-house system and its superiority in terms of cost and effectiveness.

QOC Diagram



QOC Diagram for Con#1

7 TODO Sustainability Strategies

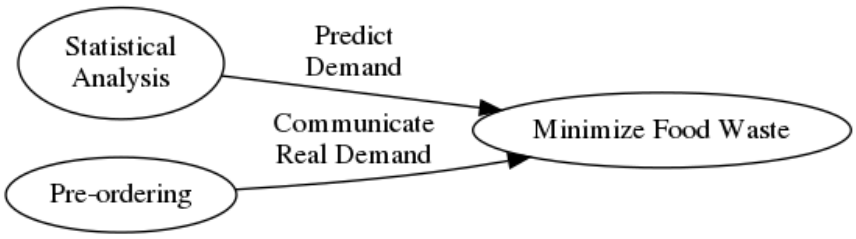
7.1 TODO SS-01 : Custom Pre-order Bento Boxes

Description Customizable lunch boxes which Students order ahead will give insight on customer buying patterns, and encourage them to take more appropriate serving sizes, and enable the return of uneaten food stuff.

Type of Strategy People Awareness

Relevance for Business Domain Offering stakeholders insight on customer buying patterns and minimizing food wastage is the primary aim of this system. The use of pre-packed bento boxes and provision for pre-orders and refunds directly helps in achieving this objective by spreading awareness of food wastage and offering incentives to follow sustainable practices.

7.1.1 TODO Diagram



7.1.2 TODO QOC Mapping