

SOD Assignment 1: Revisited

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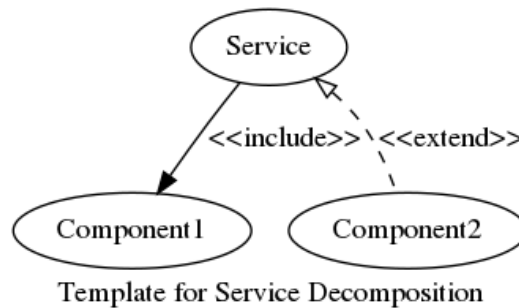
1 TODO Introduction

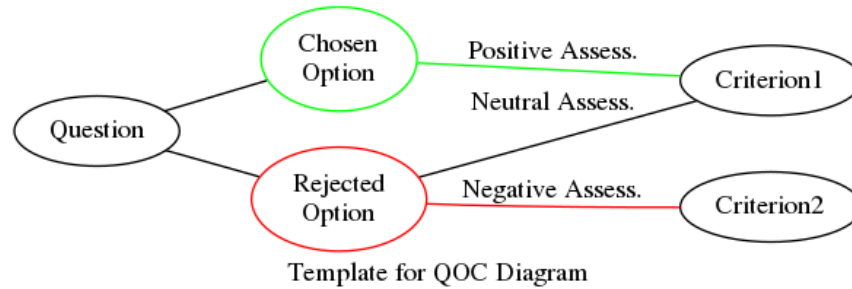
1.1 Purpose

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





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 will provide a preordering service for students and a notification service for the Cafeteria, informing it of students' orders.

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 Payment Processing company provides exactly such a service, processing pre-order payments made through an online service.

2.2.2 Users

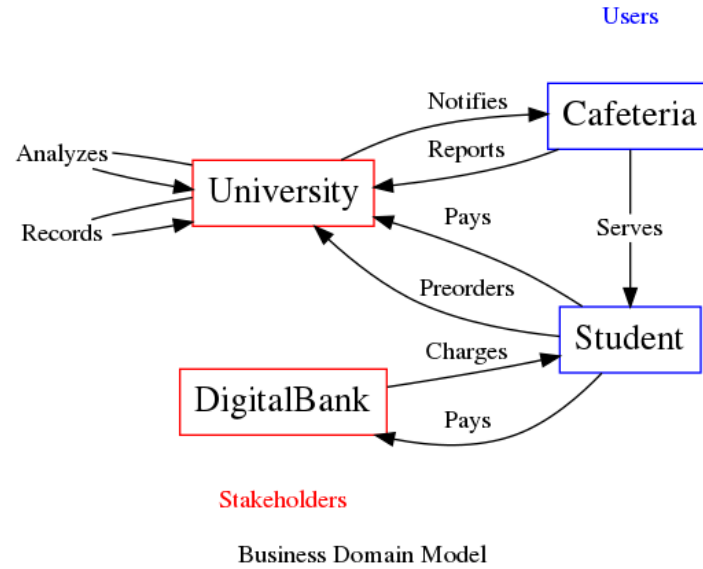
1. Cafeteria

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. DONE Students

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

2.3 DONE Model



2.4 TODO 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.

- **Record 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 through 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 DONE 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 TODO 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 standard¹ definitions.

4.1 DONE 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 TODO 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 TODO QR-03 : *Usability*

- Note taken on [2018-10-11 Thu 11:40]
Update motivation

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

¹ISO/IEC 25010:2011

4.4 TODO QR-04 : *Reliability*

Definition degree to which a system, product or component performs specified functions under specified conditions for a specified period of time

5 Business Services

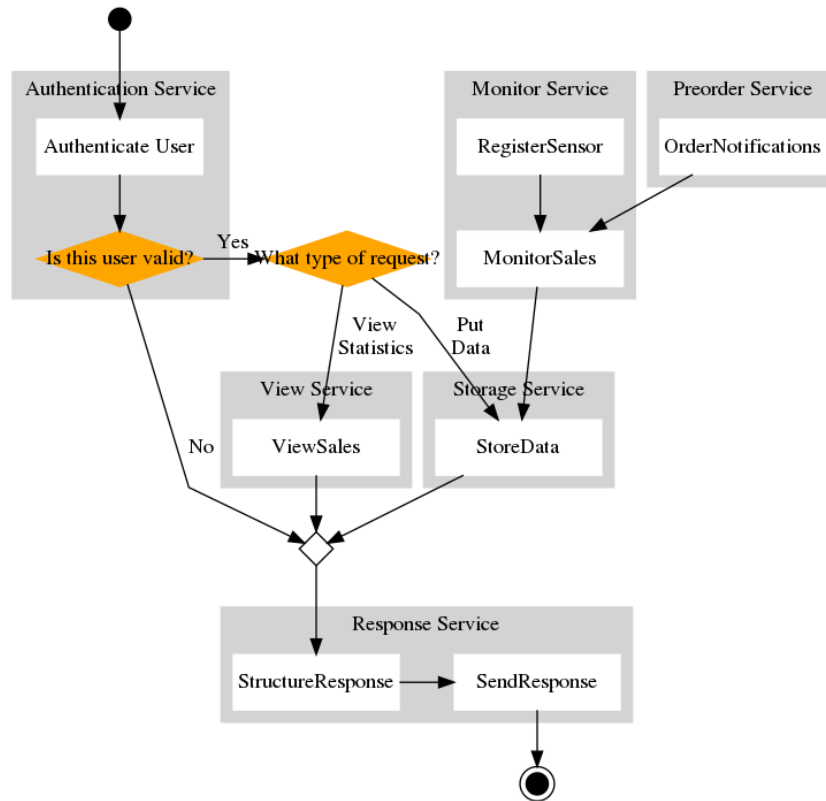
5.1 BS-01 : *Transaction Recording*

5.1.1 TODO Involved Participants

5.1.2 TODO Detailed Operational Description

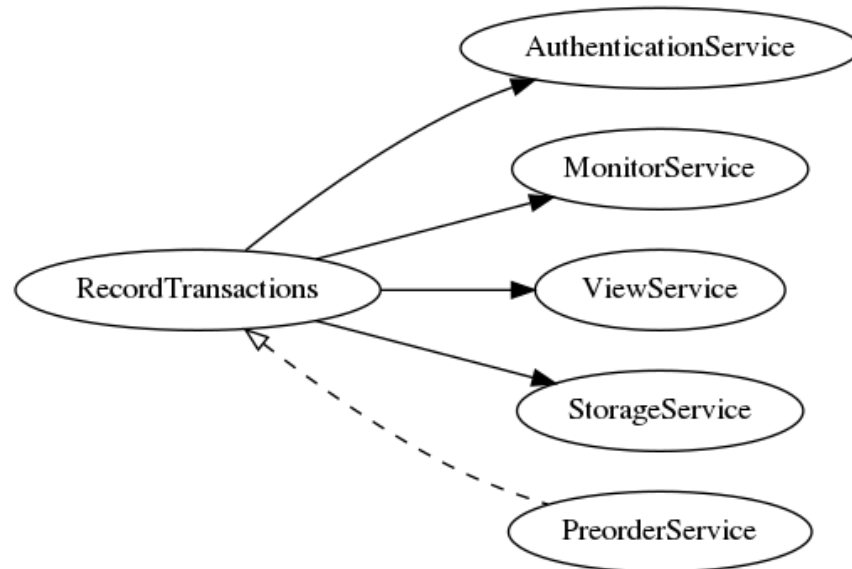
5.1.3 DONE Service Behavior

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 DONE Service Decomposition



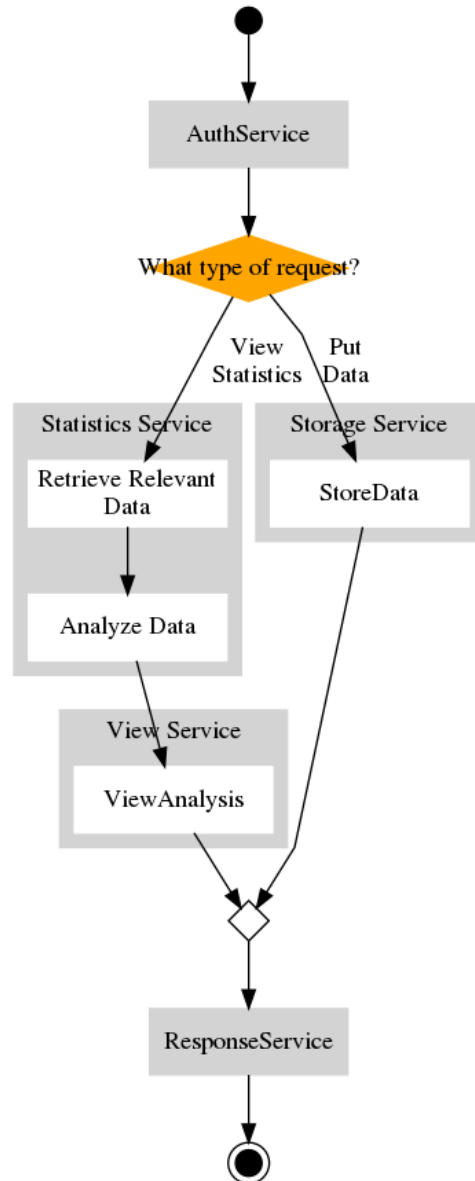
BS-01 (Transaction Recording) Service Decomposition

5.2 BS-02 : *Statistical Analysis*

5.2.1 TODO Involved Participants

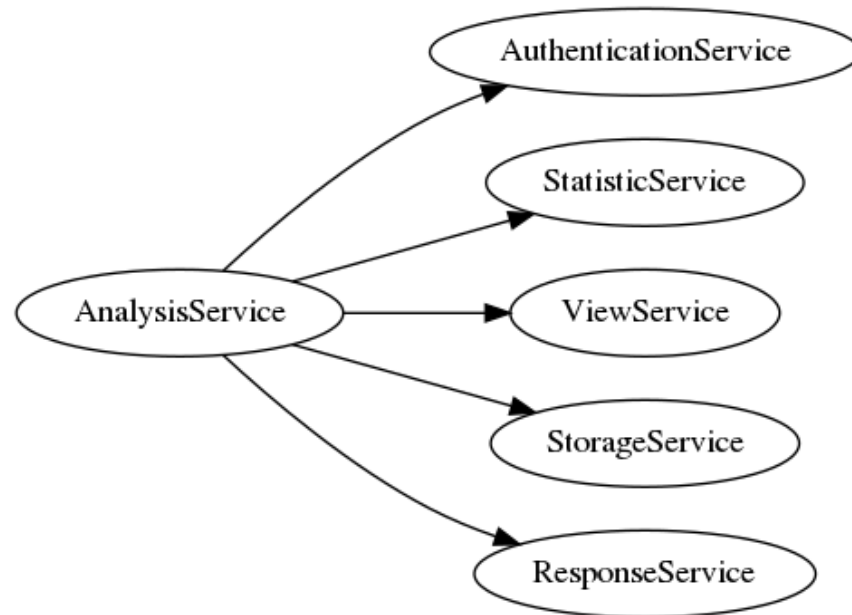
5.2.2 TODO Detailed Operational Description

5.2.3 DONE Service Behavior



BS-02 (Statistical Analysis) Activity Diagram

5.2.4 DONE Service Candidates Decomposition



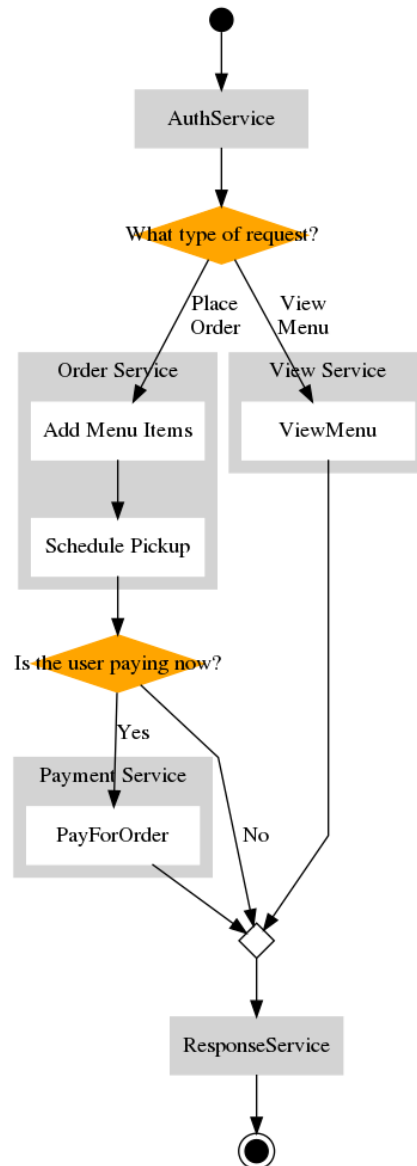
BS-02 (Statistical Analysis) Service Decomposition

5.3 BS-03 : *Preordering*

5.3.1 TODO Involved Participants

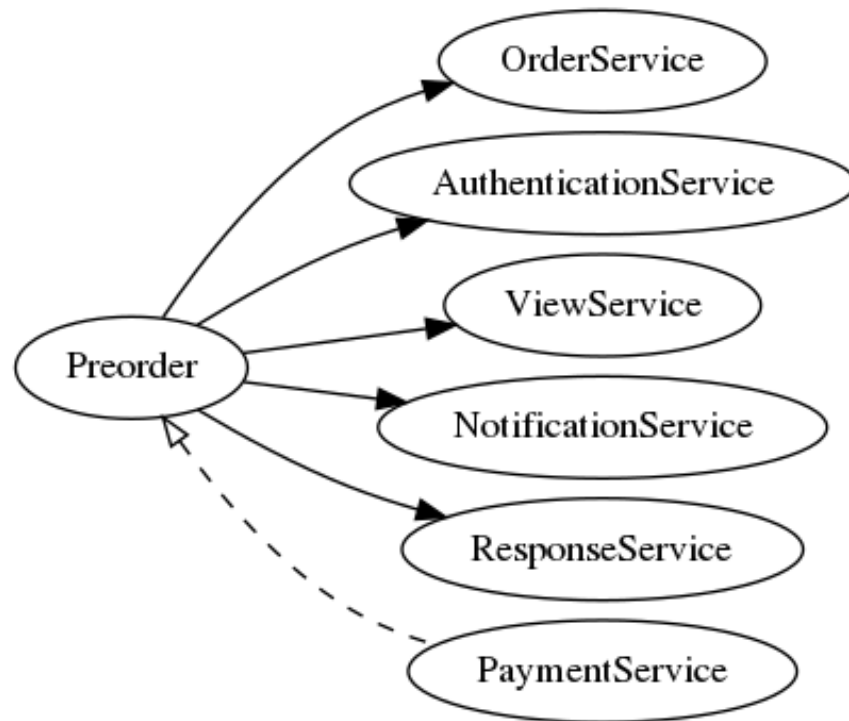
5.3.2 TODO Detailed Operational Description

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

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 little 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

- In-house Payment System

ID Con#1-Opt#3

Description

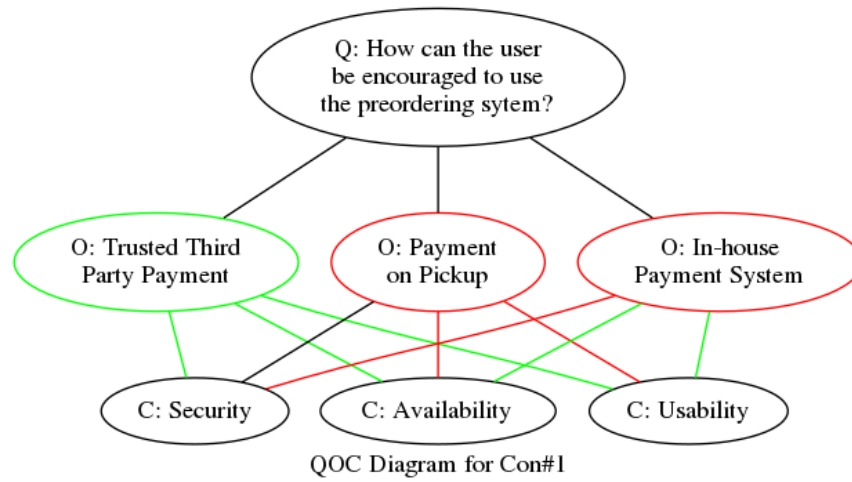
Status

Relationship(s)

Evaluation

Rationale

QOC Diagram



7 Sustainability Strategies