

Project Maitre D'ata Requirements Analysis and Models

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1. Terms and Definitions

- **Carbon copy:** A type of paper used to make exact duplicates when pressure is applied. A dark sheet of carbon was used in the past between two sheets of paper to transfer what was written on one sheet of paper. Modern technology is carbonless, without the dark sheet of carbon. The original sheet of paper with the actual writing is usually the most legible of the copies, and all other copies are then known as carbon copies.
- **Font:** An electronic representation of an alphabet character that may be printed on paper or displayed on a computer screen. A normal font style is easy to read and does not have variations associated with handwriting.
- **Guest:** A person who buys food from the Buyer's Business.
- **Merchant account:** A type of bank account that allows businesses to accept payments by payment cards, typically debit or credit cards.
- **Panther Funds:** "Panther Funds are a safe, convenient alternative to carrying cash. The Panther Fund program is free and available to all University students, faculty, and staff. Use your Panther [Identification] Card to access prepaid funds to purchase food, beverages, merchandise, and services on and off campus. There are no transaction fees or minimum balances with Panther Funds." [1]
- **Scenario:** A narrated description of a causally connected sequence of interactions between user classes and the system. A scenario has a goal, which is usually functional.
- **SMS:** A service provided by cellular providers for sending text messages via a cellular phone network. Abbreviation for short message service.
- **System:** An entity, consisting of interdependent computer hardware and software components, that performs tasks to fulfill its purpose.
- **Table turnover:** The process of servicing as many guests at a table as possible during business hours. It involves seating guests, delivering food to them, and then seating new guests when the table is cleared.
- **Text message:** An electronic message sent or received by mobile phones. These messages contain only text.
- **Text messaging:** The act of sending text messages.
- **User:** A person who interacts with the system.
- **User class:** A group of users to whom the same subset of the system's functionality is granted.

2. Overview

The document includes six sections and references. Sections 3 and 4 describe the purpose and background information in which the project originates. These sections illustrate why the project came about and the motivation behind why the development of the system was requested. Sections 5 detail the users of the system and their specific requirements for the system. Section 6 includes the external interfaces which will interact with the system. Section 7 describes the functional requirements of the system. This section offers scenarios in which these functions arise in the diner's day to day business, and system requirements necessary to provide those functions. Section 8 includes the data model diagram.

3. Purpose and Scope

On May 21, 2015, Max Headroom (hereinafter referred to as the Buyer), owner of the Data Diner restaurant (hereinafter referred to as the diner), initiated conversation with Information Science Inc. In order to maximize the profit of his Business, the Buyer needs a solution to maximize revenue, minimize the average table turn time, minimize day-to-day operation costs, and maximize the quality of customer service. Project Maitre D'ata was initiated to develop a software solution customized for the Buyer's Business to satisfy the Buyer's aforementioned business needs.

4. Background

The diner is a small restaurant located on the campus of the University of Pittsburgh. Currently, it does not employ any electronic systems, and all day-to-day operations are carried out by hand, on paper, and using simple mechanical machines. This section discusses the current processes and issues of the diner and sets the background for the requirements of the product.

4.1 Employee Classes

Based on the job description, the employees at the diner are divided into five unique classes: the kitchen staff, host staff, managers, the owner, and wait staff. Their current job descriptions are listed below.

- **Owner:** Pays employees, oversee all operations, finances, accounting, orders, generate time reports for employees, orders foodstuff for the kitchen staff, and may work among any other class of employees when necessary.
- **Managers:** Discount guest bills, remove items from guest checks, and may work among any other class of employees except the owner when necessary.
- **Host staff:** Checks dining room for open tables, seats guests, bills guests for guest orders, splits guest bills.
- **Wait staff:** Takes orders for guest tables, sends guest orders to the kitchen staff, deliver food to guest tables, and give guest order copies to the guest when they finish so they can go to pay.
- **Kitchen staff:** Receives guest orders, prepares ordered food for guests, and notifies wait staff of completed orders
- **Miscellaneous staff:** This includes busboys, dishwashers, etc.

4.2 Guest Queuing

When guests arrive at the diner and all tables are occupied, they must queue, meaning they must wait until a table opens up and it is their turn to be seated. Currently, the host staff is unable to tell newly arrived guests how long they would have to queue for, so they are left with this uncertainty while queuing. More importantly, the host staff is unable to notify queued guests remotely when they may be seated, so they are forced to stand in the queue lest they lose their place. Presented with a lengthy queue, guests are likely to walk off disgruntled and dine at a different restaurant, resulting in lost sales. With the ability to get the wait time for prospective guests and to notify waiting guests remotely of their turns, these issues will be solved and the diner will provide better customer service and entice more guests. Currently, cell phones with text messaging capabilities are ubiquitous, so notification via text messaging is viable.

4.3 Guest Ordering Methods

Currently, guests may order menu items by dining in or by phone and then pick up their orders at the diner. Having only these two methods stunts revenue growth for a couple of reasons. First, the current rate of guest orders is limited by the dine-in maximum occupancy and the rate at which the host staff picks up the phone. This rate is lower than what the kitchen staff is capable of handling, so their extra capability is wasted and revenue is not maximized. Secondly, in today's age where the internet is commonplace, consumers regularly shop online and restaurants are expected to allow online ordering. Should a restaurant fail to do so, it will regularly miss sales opportunities. The diner thus needs to have online ordering to increase the rate of guest orders so that not only may the kitchen run at full capacity and revenue be maximized, but there may also be opportunities to increase revenue beyond the current capability of the diner.

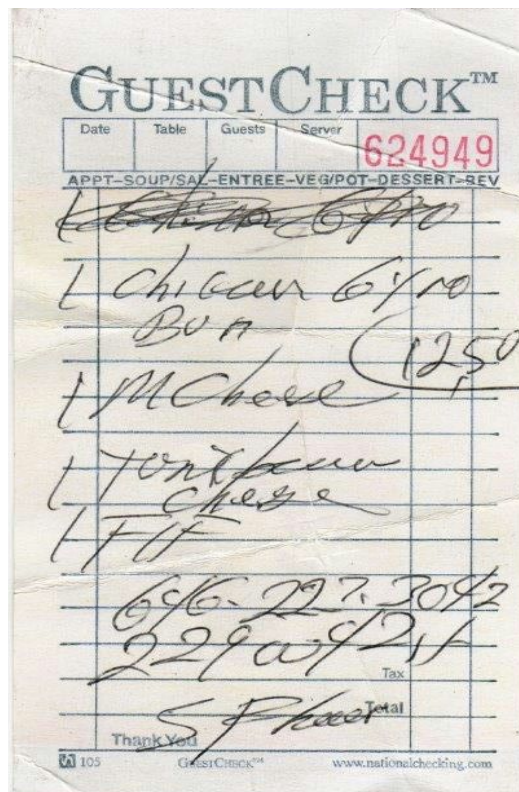
4.4 Guest Order Management

Guest orders must be stored somehow so they can be queued at the kitchen and referenced by guests for modification and by the host staff to calculate guest bills. Currently, to record and communicate guest orders, the wait staff carries around paper guest checks, writes guest orders on them, and walks to the kitchen to deliver the paper guest checks; to bill guests, the wait staff give guests the carbon copies of their guest checks, the guests go to the host stand, and the host staff uses the guest check copies to bill the guests for each item ordered.



Picture of a set of guest checks inside the kitchen that is currently being processed by the kitchen staff

However, the wait staff often produces incomprehensible guest checks due to bad handwriting and inconsistent terminology, so the kitchen and host staffs often need to clarify them, which forces guests to wait for their food or to pay for a longer time than they need to. This prolongs table turn times, thus lowering customer satisfaction and generating less revenue.



Picture of a typical guest check. Guest checks are handwritten and often incomprehensible.

In addition, the host staff currently must calculate guest bills by hand by summing the amounts on each guest check, a task that is time-consuming and prone to human error. A computer can display text in legible standardized fonts and let waiters select menu items straight from the menu instead of writing down free text, so a software system will solve the problems with handwritten paper guest checks, thus increasing table turnover rates.

4.5 Guest Payment Methods

Guest must pay for their orders to generate revenue for the diner. Currently, the diner accepts cash payments. However, it is problematic that credit cards and Panther Funds are not accepted payment methods. Credit cards have become the preferred method of payment in today's economy, and due to the venue's location on the premise of the University of Pittsburgh, guests include students who may spend Panther Funds using their University of Pittsburgh Identification Cards. Credit cards and Panther Funds are considered by most students to be much more convenient payment methods than cash, so often times prospective guests expect to be able to use them at venues on campus and thus do not carry cash. The inability to accept these two payment methods deter people near the diner from making purchases there, inhibiting revenue. This problem can be solved by having the ability to let guests pay using credit cards and Panther Funds as well as cash. Currently, a business must obtain a merchant account and a credit card reader to be able to accept credit card payments, and it must be authorized by the University of Pittsburgh to use Panther Funds. However, even the cost of getting these set up will be compensated by the additional revenue they will allow.

4.6 Employee Time Management

The owner, being the employer, must pay the employees, and an employee is paid based on the total duration of the shifts they have worked, which is calculated from their shift start and end times. Currently, time cards and a mechanical time clock machine that punches the current time on a time card are used to record these times. Employees punch their time cards at the time clock upon arrival to record start of shift and do the same upon leaving to record end of shift.



Picture of a time card being punched at the time clock

To generate paychecks, the owner collects and processes these cards by manually going through all of them and summing the hours worked for each employee. Summing the hours of each employee accurately by hand requires intense labor because even assuming that employees punch time cards successfully all the time, because most of them work part-time and some work multiple shifts per day, their shift schedules are highly disorderly, variable, and disparate from one another's. Therefore, the owner must take significant time and effort from more profitable tasks to examine individual time cards meticulously to produce accurate paychecks. A software system can accomplish this task much faster and more reliably with little supervision.

4.7 Demand Forecasting

Demand forecasting is an essential business process because it can maximize future revenue and minimize future expenses. For a diner, this means tomorrow's guest orders can be predicted, good menus can be planned, and the right food ingredients can be purchased today. The number of orders for each menu item today can be used to predict popular and unpopular menu items of the near future. However, due to the prevalent incomprehensibility and sheer number of handwritten paper guest checks that are currently in use, these numbers cannot be obtained with reasonable time and effort. As a result, without knowledge of the popular and unpopular menu items, the owner often either buys too much food ingredients for menu items that turn out not to sell well or too little to supply highly demanded ones. Moreover, the owner cannot plan better menus. These result in unnecessary waste and missed sales opportunities and leads to disappointing profits. With sales reports generated from electronic guest checks, the owner can predict guest demands and thus maximize tomorrow's profit. Therefore, this product function is required.

5. User Classes and Requirements

This section identifies the different types of users of the product, qualifies the functions each of them are required to perform, and prioritizes each requirement.

5.1 Owner

This user class corresponds to the Owner employee class (see 4.1). Having the system should greatly increase table turnaround time, which increases revenue and business productivity, and therefore profit for the owner. Also, being able to generate reports based on sales should allow the Buyer to maximize profit by eliminating unnecessary costs and focusing on the best selling menu items. Furthermore, having an electronic timekeeping system reduces errors in employee paychecks. Without the system, the owner would see lower profits from slower table turnover, wasted costs with poorly-selling items, and possible overpayment in employee paychecks.

This user class shall be able to perform the following functions with regards to the product:

- 5.1.1 Logging in. [High priority]
- 5.1.2 Logging out. [High priority]
- 5.1.3 Generating sales reports. (See 4.7.) [High priority]

5.2 Managers

This user class corresponds to the Managers employee class (see 4.1). Having the system helps managers resolve any discrepancies with guest checks, since checks should be clear and comprehensive to allow the managers to make any changes with relative ease. Also, the system allows for a reporting system that the owner can delegate access to the managers in order to run requested reports in lieu of the owner's responsibilities. Without the system, the managers would have as difficult of a time as the owner in sorting through the guest checks and employee time cards.

This user class shall be able to perform the following functions with regards to the product:

- 5.2.1 Logging in. [High priority]
- 5.2.2 Logging out. [High priority]
- 5.2.3 Discounting guest bills. (See 4.1.) [High priority]
- 5.2.4 Excluding ordered items from guest bills. (See 4.1.) [High priority]

5.3 Host Staff

This user class corresponds to the Host Staff employee class (see 4.1). To the host staff, not having the system results in the inability to generate guest bills or they must get incomprehensible guest checks from which they will generate guest bills. The host would also have difficulty in estimating the queuing times. The system monitors the progress of each guest order, which allows the host staff to see what phase tables are currently in. They would then be able to more accurately estimate wait times to queue guests.

This user class shall be able to perform the following functions with regards to the product:

- 5.3.1 Logging in. [High priority]
- 5.3.2 Logging out. [High priority]
- 5.3.3 Getting prospective guest wait times. (See 4.1 and 4.2.) [Low priority]
- 5.3.4 Dispatching table ready notifications. (See 4.1 and 4.2.) [High priority]
- 5.3.5 Queuing prospective guests. (See 4.1.) [High priority]
- 5.3.6 Unqueuing prospective guests. (See 4.1.) [High priority]
- 5.3.7 Seating prospective guests. (See 4.1.) [High priority]
- 5.3.8 Billing guests according to guest checks. [High priority]
- 5.3.9 Splitting guest bills. [High priority]
- 5.3.10 Choosing payment methods. [High priority]
- 5.3.11 Authorizing payment. [High priority]
- 5.3.12 Printing receipt. [High priority]

5.4 Wait Staff

This user class corresponds to the Wait Staff employee class (see 4.1). Without the system, the wait staff must create guest checks by hand, which has the potential of creating errors in guest orders that slow table turnover time and lower guest satisfaction.

This user class shall be able to perform the following functions with regards to the product:

- 5.4.1 Logging in to use the system. [High priority]
- 5.4.2 Logging out to use the system. [High priority]
- 5.4.3 Creating guest checks. (See 4.1 and 4.4.) [High priority]
- 5.4.4 Submitting guest checks to the kitchen. (See 4.1 and 4.4.) [High priority]
- 5.4.5 Modifying submitted guest checks. (See 4.1.) [High priority]
- 5.4.6 Splitting guest checks. [High priority]
- 5.4.7 Telling guests the status of their orders. [Low priority]
- 5.4.8 Printing guest check copies. (See 4.1 and 4.4) [High priority]

5.5 Kitchen Staff

This user class corresponds to the Kitchen Staff employee class (see 4.1). With the system, the kitchen staff receive guest orders and process accordingly. There should be little time wasted in processing. The system should clearly show the items to be cooked and shall provide the ability for the kitchen staff to update the progress of each order, and when completed, notify the wait staff of the finished orders by sending notifications to their iPads.

This user class shall be able to perform the following functions with regards to the product:

- 5.5.1 Logging in to use the system. [High priority]
- 5.5.2 Logging out to use the system. [High priority]
- 5.5.3 Indicating that a submitted guest check's guest orders are being cooked. (See 4.1.) [High priority]
- 5.5.4 Notifying the wait staff that a submitted guest check's guest order cannot be cooked. [High priority]
- 5.5.5 Notifying the wait staff that a submitted guest check's guest orders are done. (See 4.1.) [High priority]

6. External Interfaces

This section identifies, qualifies, and if necessary justifies the external systems the product shall interface with, the main functions they provide that the product shall use, and the data they shall send to or receive from the product.

6.1 Mobile Network Operator

This entity provides wireless communication services. Below are the functions required by the product and the data involved.

6.1.1 Short Message Service (SMS)

The Table Ready Notifications functional area (7.1) requires text messaging capability. Therefore, this external interface is required. Below are the data involved.

To the external system:	From the external system:
6.1.1.1 Recipient phone number 6.1.1.2 Text message body.	[None]

6.2 Merchant Account Provider

This entity provides businesses the ability to accept debit and credit cards in payment for goods and services. Below are the functions required by the product and the data involved.

6.2.1 Credit Card Services

Guest Payment (7.4) requires the ability to accept credit cards as a payment method. Therefore, this external interface is required. Below are the data involved.

To the external system:	From the external system:
6.2.1.1 Credit card number. 6.2.1.2 Credit card verification number. 6.2.1.3 Amount to pay. 6.2.1.4 Transaction authorization.	6.2.1.5 Transaction authorization request. 6.2.1.6 Transaction confirmation.

6.3 University of Pittsburgh

This entity authorizes businesses to use Panther Funds in payment for goods and services. Below are the functions required by the product and the data involved.

6.3.1 Panther Funds Services

Guest Payment (7.4) requires the ability to accept Panther Funds as a payment method. Therefore, this external interface is required. Below are the data involved.

To the external system:	From the external system:
6.3.1.1 Panther Card number. 6.3.1.2 Amount to pay. 6.3.1.3 Transaction authorization.	6.3.1.4 Transaction authorization request. 6.3.1.5 Transaction confirmation.

7. Functional Requirements

This section groups the functional requirements into six functional areas.

7.1 Table Ready Notifications

This functional area includes all the functional requirements to provide the ability to notify guests via text messaging when their tables are ready. It solves the problems described in 4.2. Section 7.1.1 provides a scenario to illustrate the relevant user requirements, while Section 7.1.2 specifies the system requirements. This functional area interacts with Electronic Guest Checks (7.2).

7.1.1 Scenario

- 7.1.1.1** The host logs into the host stand computer to use the system (5.3.1).
- 7.1.1.2** A prospective guest arrives at the restaurant, wants to wait for a table, and wants to receive a text message for when their table is ready, so the host writes down their phone number on a piece of paper. When a table opens up for those guests, the host sends the guest a text notification (5.3.4).
- 7.1.1.3** The host may continue to use the system to set up another table ready notification or logout of the host stand computer (5.3.2).

7.1.2 System Requirements

- 7.1.2.1** The host staff must provide their user credentials before being able to use table ready notifications. (Satisfies 7.1.1.1.)
- 7.1.2.2** The system shall provide the host staff the ability to enter their user credentials. (Satisfies 7.1.1.1.)
- 7.1.2.3** The system shall validate the credentials provided by the host staff. (Satisfies 7.1.1.1.)
- 7.1.2.4** While logged in as the host staff, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.1.1.3.)
- 7.1.2.5** While logged in as the host staff, the system shall provide the ability to send a table ready notification. (Satisfies 7.1.1.2.)
- 7.1.2.6** While logged in as the host staff, when a user sends a table ready notification, the system shall ask for a phone number. (Satisfies 7.1.1.2.)
- 7.1.2.7** While logged in as the host staff, when a user sends a table ready notification and a phone number is provided, the system shall send this information and a text message body saying "Table ready at Data

Diner. You have ten minutes to arrive at the host stand." to a mobile network operator. (6.1.1.1, 6.1.1.2). (Satisfies 7.1.1.2.)

7.2 Electronic Guest Checks

This functional area includes all the functional requirements to provide guest checks to manage guest orders. It solves the problems described in 4.4. Section 7.2.1 provides a scenario to illustrate the relevant user requirements, while Section 7.2.2 specifies the system requirements. This functional area interacts with Guest Payment (7.3) and Sales Reporting (7.4). In Guest Payment, initial guest bills are generated from guest checks. Sales reports are calculated from the archive of fulfilled guest checks.

7.2.1 Scenario

- 7.2.1.1** A waiter logs in to their tablet to use the system and carries the tablet around in their apron. (5.4.1)
- 7.2.1.2** As guests are seated, a waiter, using their tablet, creates a guest check for this set of guests to take their orders. (5.4.3)
- 7.2.1.3** Then, the waiter records each guest's order by entering ordered menu items from an electronic menu into the guest check, along with any preparation notes and the seat of the guest whom an ordered item is for. (5.4.3)
- 7.2.1.4** Once the orders are obtained and the guest check is finished, the waiter submits the guest check, and it will go to the end of the submitted guest check queue for the kitchen staff to process. (5.4.4)
- 7.2.1.5** While dining, guests may order more items with the wait staff, who then creates a new guest check, enters the new order into it, and submits it to the submitted guest checks queue. (5.4.3, 5.4.4)
- 7.2.1.6** Guests may, through the wait staff, modify or remove menu items in an already submitted guest check. In that case the wait staff will remove the relevant guest check from the guest check queue, perform the requested modifications and removals, and resubmit it, and the guest check will go to the place in the queue it was before or to the head of the queue if its original place has passed. (5.4.5)
- 7.2.1.7** Guests may also, through the wait staff, split a set of orders. In this case the wait staff will split the guest check into two or more guest checks, with each guest check containing the items specified by the guests. If the guest check to split has been submitted, then the spot it occupies on the submitted guest checks queue will be split into the number of resulting guest checks and the resulting guest checks will occupy those new spots in the order of their IDs. (5.4.6)
- 7.2.1.8** In addition, guests may ask their waiter about the status of their orders, in which case the waiter will view the status of their guest checks and tell them whether their guest check is waiting to be processed by the kitchen or if it is currently processed by the kitchen. (5.4.7)
- 7.2.1.9** If a guest order is in fulfillment or already fulfilled but the guest finds that the prepared item is incorrect, then the manager may comp the item, meaning preventing an item from being included in the bill. (5.2.4.)
- 7.2.1.10** A cook swipes their employee ID at the kitchen and enters the kitchen to cook for guests. (5.5.1)
- 7.2.1.11** The kitchen staff sees a queue of submitted guest checks and indicates that the next guest check in the queue is being processed by marking it as in-fulfillment. (5.5.3)
- 7.2.1.12** While processing a guest check, if a guest order cannot be prepared, then the kitchen staff notifies the relevant waiter to discuss other menu items with the guests. (5.5.4)
- 7.2.1.13** If all of the orders in a guest check are complete, the kitchen staff notifies pickup, the guest check is marked as fulfilled, and the relevant waiter receives notifications on their iPads that the order is ready for serving. (5.5.5)
- 7.2.1.14** When a cook leaves the kitchen, they will not be allowed to see guest checks until they come back in. (5.5.2)

7.2.1.15 When a guest table is finished, the wait staff brings a printed copy of their guest checks in the format of an invoice to the table, and the guests take this copy to the host stand to pay. (5.4.8)

7.2.1.16 Before a waiter returns their tablet, they log out. (5.4.2)

7.2.2 System Requirements

7.2.2.1 A guest check shall contain the following fields:

- Guest check ID: A unique value that identifies the guest check.
- Date: The date the guest check is created.
- Dining option: Dine-in or call-in.
- Waiter: The employee ID of the waiter who created this guest check.
- Table: The ID of the table where the guests are seated and for which the guest check is created.
- Number of guests: The number of guests represented by the guest check.
- Guest orders: A list of guest orders.

7.2.2.2 A guest order shall contain the following fields:

- Ordered item name: The name of the menu item the guest has ordered.
- Ordered item preparation note: Any special preparation note.
- Ordered item seat position: The seat of the guest whom this order is for.

7.2.2.3 A guest check shall have five statuses:

- Incomplete: The guest check is being populated with guest orders.
- Submitted: The guest check is queued and waiting to be cooked for by the kitchen
- In modification: The guest check was submitted but recalled.
- In fulfillment: The guest check is being cooked for by the kitchen staff.
- Fulfilled: The kitchen has finished preparing all the items in the guest check; the kitchen may notify pickup of this guest check.

7.2.2.4 The wait staff must provide their user credentials before being able to use electronic guest checks. (Satisfies 7.2.1.1.)

7.2.2.5 The system shall provide the wait staff the ability to enter their user credentials. (Satisfies 7.2.1.1.)

7.2.2.6 The system shall validate the user credentials provided by the wait staff. (Satisfies 7.2.1.1.)

7.2.2.7 While logged in as the wait staff, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.2.1.16.)

7.2.2.8 While logged in as the wait staff, the system shall provide the ability to create an incomplete guest check. (Satisfies 7.2.1.2 and 7.2.1.5.)

7.2.2.9 While logged in as the wait staff, when a user creates or continues an incomplete guest check, the system shall provide the ability to set all the fields of the guest check except the guest check ID, date, and waiter ID and the ability to add, modify, and remove guest orders. (Satisfies 7.2.1.3 and 7.2.1.5.)

7.2.2.10 While logged in as the wait staff, when a user creates an incomplete guest check, dining option, date, waiter ID, and guest check ID shall respectively be automatically set to DINE-IN, today, the ID of the user who has logged in, and an incremental serial integer. (Satisfies 7.2.1.3 and 7.2.1.5.)

7.2.2.11 While logged in as the wait staff, when a user creates or continues an incomplete guest check, the system shall provide the ability to save that guest check. (Satisfies 7.2.1.3 and 7.2.1.5.)

7.2.2.12 While logged in as the wait staff, the system shall provide the ability to view all incomplete guest checks whose waiter IDs are the same as the employee ID of the current user. (Satisfies 7.2.1.3 and 7.2.1.5.)

7.2.2.13 While logged in as the wait staff, when a user views an incomplete guest check, the system shall show all the fields of that guest check and provide the ability to continue that guest check. (Supports 7.2.1.3 and 7.2.1.5.)

7.2.2.14 An incomplete guest check must be saved in order to be viewed or continued. (Supports 7.2.1.3 and 7.2.1.5.)

- 7.2.2.15** While logged in as the wait staff, when a user creates, continues, or views an incomplete guest check, the system shall provide the ability to submit that guest check. (Satisfies 7.2.1.4 and 7.2.1.5.)
- 7.2.2.16** While logged in as the wait staff, when a user submits an incomplete guest check, the system shall change the status of that guest check to submitted and queue it to the submitted guest checks queue. (Satisfies 7.2.1.4 and 7.2.1.5.)
- 7.2.2.17** While logged in as the wait staff, the system shall provide the ability to view all submitted guest checks whose waiter IDs are the same as the employee ID of the current user. (Satisfies 7.2.1.6 and 7.2.1.8.)
- 7.2.2.18** While logged in as the wait staff, when a user views a submitted guest check, the system shall show its position in the submitted guest checks queue and all the fields of that guest check. (Satisfies 7.2.1.8.)
- 7.2.2.19** While logged in as the wait staff, when a user views a submitted guest check, the system shall provide the ability to modify and to remove submitted guest checks whose waiter ID is the same as the employee ID of the current user. (Satisfies 7.2.1.6.)
- 7.2.2.20** While logged in as the wait staff, when a user modifies a submitted guest check, the system shall provide the ability to modify and to remove guest orders of that guest check. (Satisfies 7.2.1.6.)
- 7.2.2.21** When the user adds or modifies the ordered item name of a guest order, the system shall provide the menu interface, from which the user can select the menu item. (Satisfies 7.2.1.3, 7.2.1.5, and 7.2.1.6.)
- 7.2.2.22** While logged in as the wait staff, when a user views a submitted guest check, the system shall provide the ability to split incomplete or submitted guest checks whose waiter IDs are the same as the employee ID of the current user. (Satisfies 7.2.1.7.)
- 7.2.2.23** While logged in as the wait staff, when a user splits a guest check, the system shall request the number of guest checks to split into. (Satisfies 7.2.1.7.)
- 7.2.2.24** While logged in as the wait staff, when a user specifies n as the number of guest checks to split an incomplete guest check into, the system shall create (n-1) new incomplete guest checks and then provide the ability to move guest orders from the guest check to split into the new guest checks. (Satisfies 7.2.1.7.)
- 7.2.2.25** While logged in as the wait staff, when a user specifies n as the number of guest checks to split a submitted guest check into, the system shall create (n-1) new vacant queue spots between the guest check to split and the submitted guest check after it in the queue, create (n-1) new submitted guest checks to populate those queue spots, and then provide the ability to move guest orders from the guest check to split into the new guest checks. (Satisfies 7.2.1.7.)
- 7.2.2.26** Managers must provide their user credentials before being able to use electronic guest checks. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.27** The system shall provide managers the ability to enter their user credentials. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.28** The system shall validate the user credentials provided by managers. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.29** While logged in as a manager, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.30** While logged in as a manager, the system shall provide the ability to view all guest checks. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.31** While logged in as a manager, when a user view a guest check, the system shall provide the ability to comp a guest order. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.32** While logged in as a manager, when a user comps a guest order, the system shall change the guest order's comp field to TRUE. (Satisfies 7.2.1.9 and 7.3.1.4.)
- 7.2.2.33** The kitchen staff must provide their user credentials before being able to use electronic guest checks. (Satisfies 7.2.1.10.)
- 7.2.2.34** The system shall provide the kitchen staff the ability to enter their user credentials. (Satisfies 7.2.1.10.)
- 7.2.2.35** The system shall validate the user credentials provided by the kitchen staff. (Satisfies 7.2.1.10.)
- 7.2.2.36** While logged in as the kitchen staff, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.2.1.14.)
- 7.2.2.37** While logged in as the kitchen staff, the system shall provide the ability to view all submitted guest checks.

(Satisfies 7.2.1.11.)

- 7.2.2.38** While logged in as the kitchen staff, the system shall provide the ability to dequeue a submitted guest check from the submitted guest checks queue. (Satisfies 7.2.1.11.)
- 7.2.2.39** While logged in as the kitchen staff, when the submitted guest check to be dequeued is being modified or split, the system shall prevent the guest check from being dequeued. (Satisfies 7.2.1.6, 7.2.1.7, and 7.2.1.11.)
- 7.2.2.40** While logged in as the kitchen staff, when a user dequeues a submitted guest check, the system shall change the status of the guest check to in fulfillment. (Satisfies 7.2.1.11.)
- 7.2.2.41** While logged in as the kitchen staff, the system shall provide the ability to view all in-fulfillment guest checks. (Satisfies 7.2.1.11.)
- 7.2.2.42** While logged in as the kitchen staff, when a user views an in-fulfillment guest check, the system shall provide the ability to notify the wait staff of a guest order that cannot be cooked for. (Satisfies 7.2.1.12.)
- 7.2.2.43** While logged in as the kitchen staff, when the user notifies the wait staff of a guest order that cannot be cooked for, the system shall change the status of the guest check to submitted and move the guest check to the head of the submitted guest checks queue, and notify the waiter whose employee ID is the same as the waiter ID of the guest check of failed guest check. (Satisfies 7.2.1.12.)
- 7.2.2.44** While logged in as the wait staff, when a user is notified of a failed guest check, the system shall display a message saying "CANNOT COOK FOR TABLE " followed by the table ID. (Satisfies 7.2.1.12.)
- 7.2.2.45** While logged in as the kitchen staff, when a user view an in-fulfillment guest check, the system shall provide the ability to notify the wait staff of pickup. (Satisfies 7.2.1.13.)
- 7.2.2.46** While logged in as the kitchen staff, when a user notifies the wait staff of pickup, the system shall change the status of the guest check to fulfilled. (Satisfies 7.2.1.13.)
- 7.2.2.47** While logged in as the kitchen staff, when a user notifies the wait staff of pickup, the system shall notify the waiter whose employee ID is the same as the waiter ID of the guest check of pickup. (Satisfies 7.2.1.13.)
- 7.2.2.48** While logged in as the kitchen staff, when a user notifies the wait staff of pickup and the waiter associated with the guest check is not logged in, the system shall notify all waiters of pickup. (Satisfies 7.2.1.13.)
- 7.2.2.49** While logged in as the wait staff, when a user is notified of pickup, the system shall display a message saying "PICK UP FOR TABLE " followed by the table ID. (Satisfies 7.2.1.13.)
- 7.2.2.50** While logged in as the wait staff, the system shall provide the ability to view all fulfilled guest checks. (Satisfies 7.2.1.15.)
- 7.2.2.51** While logged in as the wait staff, when a user views a fulfilled guest check, the system shall show all fields of the guest check and provide the ability to print guest check copy. (Satisfies 7.2.1.15.)
- 7.2.2.52** While logged in as the wait staff, when a user prints a guest check copy, the system shall print all fields of the guest check. (Satisfies 7.2.1.15.)

7.3 Guest Payment

This functional area includes all the functional requirements to provide the ability to accept guest payments via cash, credit cards, or Panther Funds in order for them to pay for their orders. It solves the problems described in 4.5. Section 7.3.1 provides a scenario to illustrate the relevant user requirements, while Section 7.3.2 specifies the system requirements. This functional area interacts with Electronic Guest Checks (7.2). Guest checks produce guest bills which are then paid for through guest payment.

7.3.1 Scenario

- 7.3.1.1** The host staff logs into the host stand computer to use the system. (5.3.1)

- 7.3.1.2** The host staff enters the guest check IDs noted on the guest check copy that guests have brought, and the system generates a guest bill which those guests must pay for. (5.3.8)
- 7.3.1.3** If guests ask to pay for a guest check separately, the host staff splits the guest bill into multiple guest bills. (5.3.9)
- 7.3.1.4** If guests ask for an ordered item to be removed from the guest bill, the manager is called over and may comp an item, and the guest bill is regenerated. (5.2.4)
- 7.3.1.5** On occasions, the manager may apply a discount to a guest bill, and the guest bill is regenerated. (5.2.3)
- 7.3.1.6** When a guest bill is finalized, the host staff asks the guests if they want to pay by cash, credit card, or Panther Funds. (5.3.10)
- 7.3.1.7** If guests pay by cash, then the host staff obtains an amount of cash from them. (5.3.10)
- 7.3.1.8** If guests pay by credit card, then the host staff obtains a credit card from the guests, inputs it into the system, and observes a payment authorization request. (5.3.10)
- 7.3.1.9** The guest then provides a signature to the host staff, and the host staff authorizes payment. (5.3.11)
- 7.3.1.10** If guests pay by Panther Funds, then the host staff obtains a Panther Card from the guests, inputs it into the system, and observes a payment authorization request. (5.3.10)
- 7.3.1.11** The guest then provides a payment permission to the host staff and the host staff authorizes payment. (5.3.11)
- 7.3.1.12** If the payment is successful, the host staff sees a payment success message. (5.3.11)
- 7.3.1.13** Otherwise, the host staff observes a payment failure message and the process goes back to 7.3.1.6. (5.3.11)
- 7.3.1.14** If the guest bill is not completely paid for then the process also goes back to 7.3.1.6. (5.3.8)
- 7.3.1.15** After the payment is successful, the host staff would ask the guest if they want to print the receipt or not. (5.3.12)
- 7.3.1.16** The host may continue to use the system or logout of the host stand computer. (5.3.2)

7.3.2 System Requirements

- 7.3.2.1** The host staff must provide their user credentials before being able to use guest payments. (Satisfies 7.3.1.1.)
- 7.3.2.2** The system shall provide the host staff the ability to enter their user credentials. (Satisfies 7.3.1.1.)
- 7.3.2.3** The system shall validate the user credentials provided by the host staff. (Satisfies 7.3.1.1.)
- 7.3.2.4** While logged in as the host staff, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.3.1.16.)
- 7.3.2.5** While logged in as the host staff, the system shall provide the ability to enter a guest check ID. (Satisfies 7.3.1.2.)
- 7.3.2.6** While logged in as the host staff, when a user enters a guest check ID, if the guest check identified by this ID cannot be found, the system shall display a message saying "INVALID GUEST CHECK #" followed by the guest check ID, then provide the ability to reenter a guest check ID. (Satisfies 7.3.1.2.)
- 7.3.2.7** While logged in as the host staff, when a user enters a guest check ID, if the guest check identified by the ID is found, the system shall return a guest bill whose ID is set to an automatically incremented integer, date to today, and subtotal to the sum of the prices of all the guest orders in the guest check whose comp value is FALSE. (Satisfies 7.3.1.2.)
- 7.3.2.8** While logged in as the host staff, when a user gets a guest bill, the system shall provide the ability to split the guest bill. (Satisfies 7.3.1.3.)
- 7.3.2.9** While logged in as the host staff, when a user splits a guest bill, the system shall request the number of guest bills to split into. (Satisfies 7.3.1.3.)
- 7.3.2.10** While logged in as the host staff, when a user specifies n as the number of guest bills to split a guest bill

into, the system shall create (n-1) new guest bills whose guest check and host fields are the same as the guest bill to split and then provide the ability to move guest orders from the guest bill to split into the new guest bills. (Satisfies 7.3.1.3.)

7.3.2.11 Managers must provide their user credentials before being able to use guest payments. (Satisfies 7.3.1.4 and 7.3.1.5.)

7.3.2.12 The system shall provide managers the ability to enter their user credentials. (Satisfies 7.3.1.4 and 7.3.1.5.)

7.3.2.13 The system shall validate the user credentials provided by managers. (Satisfies 7.3.1.4 and 7.3.1.5.)

7.3.2.14 While logged in as a manager, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.3.1.1, 7.3.1.4, and 7.3.1.5.)

7.3.2.15 While logged in as a manager, the system shall provide the ability to view all guest bills. (Satisfies 7.3.1.4 and 7.3.1.5.)

7.3.2.16 While logged in as a manager, when a user views a guest bill, the system shall provide the ability to set the percent deducted of that guest bill. (Satisfies 7.3.1.5.)

7.3.2.17 The percent deducted of a guest bill must be a two-decimal number between 0.00 and 1.00. (Satisfies 7.3.1.5.)

7.3.2.18 While logged in as the host staff, the system shall provide the ability to generate the total of a guest bill. (Satisfies 7.3.1.5 and 7.3.1.6.)

7.3.2.19 The total of a guest bill must be the subtotal multiplied by the number that is one minus the percent deducted. (Satisfies 7.3.1.5.)

7.3.2.20 While logged in as the host staff, when a user view a guest bill, the system shall provide the ability to create a guest payment whose guest bill field is the guest bill being viewed. (Satisfies 7.3.1.6.)

7.3.2.21 While logged in as the host staff, when a user creates a guest payment, the system shall provide the ability to choose either cash, credit card, or Panther Fund as payment method. (Satisfies 7.3.1.6.)

7.3.2.22 While logged in as the host staff, when a user creates a guest payment, the system shall provide the ability to set the amount to pay. (Satisfies 7.3.1.7, 7.3.1.8, 7.3.1.10, and 7.3.1.14)

7.3.2.23 The amount to pay of a guest payment cannot be greater than the total of the guest bill specified by its guest bill field value. (Satisfies 7.3.1.7, 7.3.1.8, and 7.3.1.10.)

7.3.2.24 While logged in as the host staff, when a user creates a guest payment and payment method is set to cash, the system shall provide the ability to submit the guest payment. (Satisfies 7.3.1.7 and 7.3.1.12.)

7.3.2.25 While logged in as the host staff, when a user creates a guest payment and payment method is set to credit card, the system shall provide the ability to enter credit card number and verification number. (Satisfies 7.3.1.8.)

7.3.2.26 While logged in as the host staff, when a user enters credit card number and verification number, the system shall send this information and the amount to pay to the credit card services (6.2.1.1, 6.2.1.2, 6.2.1.3) and obtain a transaction authorization request (6.2.1.5). (Satisfies 7.3.1.8.)

7.3.2.27 If a credit card services transaction authorization request (6.2.1.5) instead indicates the credit card is invalid, the system shall display a message saying "INVALID CREDIT CARD" and provide the ability to rechoose payment method. (Satisfies 7.3.1.8 and 7.3.1.13.)

7.3.2.28 While logged in as the host staff, when a user observes a credit card services transaction authorization request, the system shall provide the ability to authorize payment. (Satisfies 7.3.1.9.)

7.3.2.29 While logged in as the host staff, when a user authorizes a credit card payment, the system shall send this information to the credit card services (6.2.1.4) and obtain a transaction confirmation (6.2.1.5). (Satisfies 7.3.1.9.)

7.3.2.30 If a credit card services transaction confirmation (6.2.1.5) instead indicates the credit card transaction is invalid, the system shall display a message saying "INVALID CREDIT CARD TRANSACTION" and provide the ability to rechoose payment method. (Satisfies 7.3.1.9 and 7.3.1.13.)

7.3.2.31 While logged in as the host staff, when a user creates a guest payment and payment method is set to Panther Fund, the system shall provide the ability to enter Panther Card number. (Satisfies 7.3.1.10.)

- 7.3.2.32** While logged in as the host staff, when a user enters Panther Card number, the system shall send this information and the amount to pay to the Panther Funds services (6.3.1.1, 6.3.1.2) and obtain a transaction authorization request (6.3.1.4). (Satisfies 7.3.1.10.)
- 7.3.2.33** If a Panther Funds services transaction authorization request (6.3.1.4) instead indicates the credit card is invalid, the system shall display a message saying "INVALID PANTHER CARD" and provide the ability to rechoose payment method. (Satisfies 7.3.1.10 and 7.3.1.13.)
- 7.3.2.34** While logged in as the host staff, when a user observes a Panther Funds services transaction authorization request, the system shall provide the ability to authorize payment. (Satisfies 7.3.1.11.)
- 7.3.2.35** While logged in as the host staff, when a user authorizes a Panther Fund payment, the system shall send this information to the Panther Funds services (6.3.1.4) and obtain a transaction confirmation (6.3.1.5). (Satisfies 7.3.1.11.)
- 7.3.2.36** If a credit card services transaction confirmation (6.3.1.4) instead indicates the Panther Funds transaction is invalid, the system shall display a message saying "INVALID PANTHER FUNDS TRANSACTION" and provide the ability to rechoose payment method. (Satisfies 7.3.1.11 and 7.3.1.13.)
- 7.3.2.37** While logged in as the host staff, when a user observes a credit card services transaction confirmation or a Panther Funds services transaction request, the system shall provide the ability to submit the guest payment. (Satisfies 7.3.1.12.)
- 7.3.2.38** While logged in as the host staff, when a user submits a guest payment, the system shall change the paid field of that guest payment to TRUE and display a message saying "REMAINING AMOUNT: " followed by the two-decimal number that is equal to the total of the guest bill whose ID is the same as the guest bill field of that guest payment subtracted by the sum of all guest payments whose guest bill is the same as the guest bill of that guest payment and whose paid value is TRUE. (Satisfies 7.3.1.12 and 7.3.1.14.)
- 7.3.2.39** While logged in as the host staff, when a user submits a guest payment and the sum of the amounts of all guest payments with the same guest bill whose paid field is set to TRUE equals the total of that guest bill, the system shall change the paid field of that guest bill to TRUE and provide the ability to print a receipt. (Satisfies 7.3.1.15.)
- 7.3.2.40** While logged in as the host staff, when a user prints a receipt, the system shall print all the fields of the guest bill. (Satisfies 7.3.1.15.)

7.4 Table Turn Time

This functional area includes all the functional requirements to provide the time it takes to turn tables in order to increase guest satisfaction. It allows prospective guests to know how long they would need to wait in a queue and current guests how long they would need to wait to receive their food. Section 7.4.1 provides a scenario to illustrate the relevant user requirements, while section 7.4.2 specifies the system requirements. This functional area interacts with the Electronic Guest Checks (7.2) and the Table Ready Notifications (7.1). The electronic guest checks provide the items, which have specific processing times that can be used for calculation.

7.4.1 Scenario

- 7.4.1.1** The host logs into the host stand computer to use the system. (5.3.1)
- 7.4.1.2** A prospective guest arrives at the diner and wishes to know how long they will need to wait for a table, so the host staff uses the system to get the estimated wait time. (5.3.3).
- 7.4.1.3** The host may continue to use the system or logout of the host stand computer (5.3.2).

7.4.2 System Requirements

- 7.4.2.1** The host staff must provide their user credentials before being able to use table turn time. (Satisfies 7.4.1.1.)
- 7.4.2.2** The system shall provide the host staff the ability to enter their user credentials. (Satisfies 7.4.1.1.)
- 7.4.2.3** The system shall validate the credentials provided by the host staff. (Satisfies 7.4.1.1.)
- 7.4.2.4** While logged in as the host staff, the system shall provide the user the ability to revoke their user credentials. (Satisfies 7.4.1.3.)
- 7.4.2.5** The system shall calculate table turn time by processing the current guest checks using the following methods:
- Each guest check has menu items ordered and quantity. Each item has a known processing (cooking) time, which shall then be multiplied by the quantity of that item.
 - The processing times for each item shall then be summed to calculate the total check processing time. This time is how long the guests who ordered the menu items must wait before they receive their food from the wait staff.
 - The system shall determine which guest check has the least processing time. This time shall be the table turn time displayed to the host.
- (Satisfies 7.4.1.2.)
- 7.4.2.6** The system shall display the table turn time on the host stand computer screen. (Satisfies 7.4.1.2.)

7.5 Sales Reporting

This functional area includes all the functional requirements to provide the ability to generate sales reports, which contains the number of orders for each menu item over a given time span, to let the owner predict tomorrow's business and plan accordingly. It solves the problems described in 4.7. Section 7.5.1 provides a scenario to illustrate the relevant user requirements, while Section 7.5.2 specifies the system requirements. This functional area relies on Electronic Guest Checks (7.2). The electronic archive of guest checks provide the order count for each menu item in the past, which is necessary to generate sales reports.

7.5.1 Scenario

- 7.5.1.1** The owner wishes to generate a sales report to determine which menu items have sold the most or least during a given time span in order forecast demand (4.7) and logs into the system to navigate to the sales reporting service.
- 7.5.1.2** The owner chooses to view the best-selling menu items or the worst-selling items over a given time span.
- 7.5.1.3** The system generates the report and displays the menu item names and total sales, which can be sorted to determine which sold the most or least.
- 7.5.1.4** The owner can then generate additional reports, such as what days of the week an item is most or least popular. These report options should also be available from the main screen (5.1.3).
- 7.5.1.5** The owner logs out when finished (5.1.2).

7.5.2 System Requirements

- 7.5.2.1** The owner must provide their user credentials before being able to use sales reporting. (Satisfies 7.5.1.1.)
- 7.5.2.2** The system shall provide the owner the ability to enter their user credentials. (Satisfies 7.5.1.1.)
- 7.3.2.3** The system shall validate the user credentials provided by the owner. (Satisfies 7.5.1.1.)
- 7.5.2.4** While logged in as the owner, the system shall provide the user the ability to revoke their user credentials (Satisfies 7.5.1.5).
- 7.5.2.5** The system shall provide the owner the ability to select the type of report. (Satisfies 7.5.1.2.)

- 7.5.2.6** The system shall provide the owner the ability to specify a date or time range (Satisfies 7.5.1.2).
- 7.5.2.7** The system shall validate that the date is in the correct format of month, day and year.
- 7.5.2.8** The system shall validate that the time is in the correct format of hours, minutes, and AM or PM.
- 7.6.2.9** The system shall return an error message to the user if either the date or time entered are not in the correct format.
- 7.5.2.10** The system shall calculate the total number of item sales from the electronic guest checks within the date or time span specified by the owner by summing the quantity of every item on the checks whose date and time stamps are within the specified range (Satisfies 7.5.2.3 and 7.5.2.4).
- 7.5.2.11** The system shall return the the results of the calculations on the screen in the report type specified by the owner (Satisfies 7.5.1.4).
- 7.5.2.12** The system shall provide the user the ability to display the results in graphical form.

8. Data Model

Below is a class diagram describing the data model of the system.

