Majuro Stevedore & Terminal Co.
Executive Summary

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Development Partner, Charles Stinnett, MSTCo

I. About the Organization

The mission of Majuro Stevedore and Terminal Company is to provide cargo handling and stevedoring services for the island of Majuro.

Majuro Stevedore and Terminal Co. (MSTCo) is a cargo transportation and logistics company located in Majuro, Republic of the Marshall Islands (RMI). It is the only such company in Majuro, and thus, is responsible for all handling of cargo containers that come to the atoll via ship. Aside from container handling, MSTCo also rents various forms of equipment.

II. About the Project from Summer 2017

A TCinGC team previously came in for a consulting engagement with the company, in which they built a database system with three user interfaces. Despite being designed to store information on many business processes, only one component of the information system was used in the long term, and the information system was completely in disuse after the employee in charge of entering data into the system left the company in early 2019.

III. Update the Database Model

On analysis of the business processes of the company, the consultants felt that the current database model needed to be extended and modified in order to further meet the needs of the company. To remedy this, several changes were made to the model—the consultants changed how entities are related to each other, added new tables, added additional fields to existing tables, and consolidated tables. In addition, validations and macros were added in order to ensure the validity of data.

IV. Improve the Usability of the Information System

It was realized that the information system from summer 2017, although very functional, did not meet MSTCo's needs because it had not been fully integrated and adopted. The goal, then, was to create user interfaces from scratch that comprehensively support the needs of various members of the organization, ensure quick adoption, as well as create workflows that make the best use of the system.

V. Train Employees on Databases & Systems

An important priority for this project was training, since that is what was understood prevented the full utilization of the information system developed originally. The consultants engaged in extensive cross-training so that employee turnover doesn't result in lost technical knowledge related to usage of the information system.

VI. Other Miscellaneous Technology Updates

The Power BI business intelligence tool was rehauled to allow the management to access reports with various charts that depict information about the business operations. The primary benefit consists of having immediate access to aggregate data about voyages, containers and consignees that can provide a high-level sense about the current health of the business. Secondarily, with such a utility in place, the management can conveniently oversee the proper usage of the information system and thus continue to benefit from it.

There is still some scope for improvement in the system that can be undertaken in the future:

- Ability to enter information about refrigerated containers' (reefers) power consumption is not currently built into the system.

  Reefers need to plugged-in to power at the container yard for storage. Currently, the information about when the reefers are connected and disconnected is recorded manually. Adding this component to the database solution can simplify calculating reefer plug-in charges and provide easy access to this data.

- In the future, a completely digital hatch log can be considered.

  Currently, the checkers first record the hatch log on paper, describing loading and unloading activities occurring when a ship is at the dock. This hatch log is then later entered into the solution either at the dock using a laptop, time permitting, or at the checkpoint or main office the next day. A digital hatch log would reduce human error to a great degree and eliminate the need to enter data again.

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Final Consulting Report

Student Consultants, Aditya Chanana & Ryan Eckert
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VII. About the Organization

Organization

The mission of Majuro Stevedore and Terminal Company is to provide cargo handling services for the island of Majuro.

Majuro Stevedore and Terminal Co. (MSTCo.) is a cargo transportation and logistics company located in Majuro, Republic of the Marshall Islands (RMI). It is the only such company on the island, and thus, is responsible for all handling of cargo containers that come to the island via ship. Aside from container handling, MSTCo also rents various forms of equipment.

MSTCo has 5 board members and 150 individual stockholders. There are currently 65 employees. The company deals with three main shipping agents (which own vessels and containers): Matson Navigation Company, Inc., RRE (which works with Kyowa Shipping Company, Limited; and with Swire Shipping), and Pacific Shipping Inc. (which works with Pacific Direct Line); and with local customers (who own the contents of the containers). Both stakeholders are equally important regarding revenues.

Facilities

The entirety of MSTCo is currently located in one campus, consisting of the main office, checker office, security office, operations office, container yard, garage, warehouse, and dock.

The main office is a two-story building that is at the front of the property. Most administrative activities take place here, and it is physically connected to the warehouse. The CEO's office, accountant's office, and most administrative desks are located in this building. Clients also come to the main office to get their cargo, or to order it to be delivered to their location.

The warehouse is attached to the main office and is where break bulk, goods not stored in a shipping container, are held.

The checker and security office are on either side of the entrance to the shipping yard, with the checker office being on the side right next to the main office. The checker office has a computer which the checker uses to keep track of containers entering and leaving the yard, whereas security logs all inbound and outbound containers on paper when they happen. The checkers occasionally verify their information with security logs, particularly with containers that are returned to the yard outside of business hours.

The container yard is where all containers are kept, and it takes up most of the physical space. On one end of the yard is the garage, where machinery goes to be repaired and it is also the location of the company store.

The dock is at the far end of the container yard, on the lagoon. Ships pull up to the dock to have containers loaded and unloaded.

There is another campus in the works in 2020, in downtown Majuro, but the affairs there have been said to be different than the ones in the main campus.

Programs

MSTCo has two main functions, one is to stevedore cargo containers for the Port of Majuro, and the other is to deliver containers to customers.

Stevedoring cargo consists of loading and unloading ships whenever they dock at the Port of Majuro. Prior to the ship's arrival, a shipping agent usually contacts MSTCo with information regarding containers to be offloaded, containers to be loaded, and delivery orders/bills of lading for cargo with a final destination in Majuro. All costs regarding unloading and loading are ultimately billed to the shipping agent.

Once cargo bound for Majuro arrives in MSTCo's shipping yard, it then must be delivered to the respective consignees. The shipping agent will notify the various consignees that their cargo has arrived at MSTCo. The consignee will come to MSTCo with customs clearance and order the container or good to be delivered to their location. Associated handling and delivery fees are billed to the consignee.

Aside from its main operations, MSTCo also rents out tents, coolers, chairs, and similar objects. Such rentals are often for community events and are not a significant source of income.

Computer systems are used for accounting and payroll. The program Sage is use for accounting and invoicing, whereas Fingertec is in use for payroll and logging employee hours.

A Wix website was also developed as a part of the same project in 2017, but the website was not linked to the main domain name, with domain name currently directing to a Wix error page.

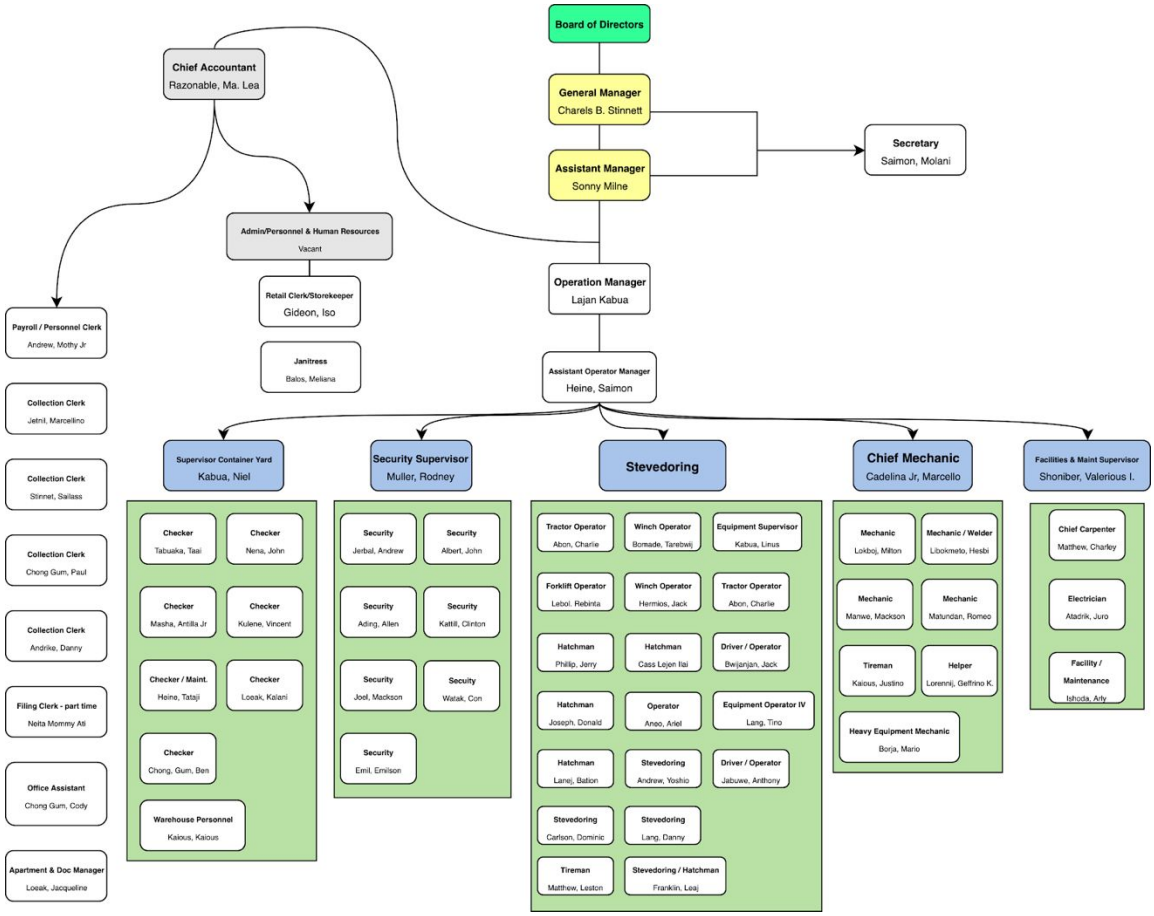
Staff

Internally, MSTCo is organized in departments:

- Administration:
    - General Manager: Charles Stinnett.
    - Assistant manager: Sonny Milne.
    - Accountant: Ma. Lea Razonable
    - Payroll: Mothy Andrew Jr.
- Retail store: employees can take up to $50 in merchandise that will be deducted from their salary in the next paycheck. Only one employee. Supervisor: Ma. Lea Razonable..
- Operations: biggest department. Operation Manager: Lajan Kabua. Assistant Operation Manager: Simon Heine. Operations encompasses:
    - Stevedores.
    - Container Yard. Container Yard supervisor: Neil Kabua.
    - Garage. Chief Mechanic: Marcelo Cadelina Jr.
    - Maintenance. Facilities and Maintenance Supervisor: Valerious I. Shoniber.

- Security. Supervisor: Rodney Muller.
- Driver Operators. Supervisor: Linus Kabua.

The next image depicts the organizational chart.



Technology Infrastructure

MSTCo has 11 computers within the main building, all connected to the internet and a LAN. There is another computer in the checking station outside that is also connected to the internet and the LAN. There is a server contained on one computer that is connected to the LAN, and another server on a different computer that mirrors the first as a backup. All computers run Windows, but the version varies computer by computer.

All phones and security cameras in the premises are IP-based. There is a microwave link to connect the phones, security cameras, and Wi-Fi access point at the operations office to the main office, which are physically separated by 150 meters.

The security cameras store recordings in a network-attached storage located in the managing director's office. MSTCo's IT support firm, Pacific Core Inc., has been assigned to set up regular backups of the contents of the main sever, which includes accounting data and the solution created by the consultants, to the NAS.

Software updates are not performed regularly. The software packages installed vary on a computer by computer basis.

Technology Management

There is no formal technology management infrastructure. Employees improve technology where they see fit and are capable (mainly Excel spreadsheets in accounting and the checkpoint). The company has a contract with an IT support firm, Pacific Core Inc., that handles maintenance of their network, servers, computers and IP cameras. When IT issues arise, they are the ones who are called.

The accounting data is saved on the server. Log data on the checkpoint computer is also saved on the server.

Technology Planning

Charles Stinnett is responsible for technology planning. When opportunities arise for technological improvement, regardless of whether he discover them or someone brings them to his attention, he is responsible for analyzing the information and making a decision.

Sonny Milne is also responsible for carrying out the technology planning. Sonny frequently communicates with Pacific Core on upgrading the state of technology on the MSTCO compus.

Communication

Internal communication is often done either face-to-face or by phone. Memos are used seldomly. Emails not used between all employees, but between those in administration, email dialogues occur. Some staff have email accounts, but not all.

External communication often occurs via phone call or face-to-face communication. Email is frequently used in order to send files, but is less time-sensitive than calling.

Information Management

Aside from some accounting data, information is currently managed mostly using paper and Excel spreadsheets. It is often recorded on paper and then entered into computers 1-3 times. Excel spreadsheets have been created by employees that saw openings for their implementation.

Both 2017's engagement as well as this engagement moved towards encoding data in a Microsoft Access database, which has already seen a return in the ability to look up data and store. The database system and paper systems are used in tandem, with paper documents such as hatch logs being transcribed after their completion. There are still errors, however, both at the initial recording of data as well as transcribing errors into the system.

Business Systems

Sage MAS 100 is used as the accounting system with MSTCO, upgraded from MAS 90 since the last consulting engagement. The accountant, Lea, has been using and becoming well acquainted with the Sage software over the past year. In addition, the accounting consultant Marc is also well versed with Sage and occasionally comes when requested.

Fingertec functions as the company's employee timecard system but it is not integrated with accounting for payroll. Reports must be generated from Fingertec, reviewed for errors (e.g. not clocking out for lunch, clocking in too early, not clocking out, etc.), verified by Lea, and then entered into MAS 100 to generate payments. Fingertec integration into the accounting system could greatly improve this process. RetailEdge is being used within the company store. This system is also not integrated with MAS 100.

VIII. Project Details

Despite having had a student team come in 2 years ago, there are multiple areas in which the solution can be improved and extended. In large part, the solution itself is still functional. However, in more ways than one it fails to support the needs and culture of the organization.

The largest issue with the current solution is its integration, or lack of, into the current organizational system. As of last December, data was being entered into the database at very late in the stevedoring process by a single member of the organization. Data extraction was also not being used to its full extent, as most users who needed the data were not trained on means for data extraction. Since most users had not been transitioned to the new system, most members continued to use the old information system, resulting in only portions of the database solution were being used while most of the solution went unutilized.

The solution delivered in 2017 is solidly and well designed. However, we have found areas where it can be iterated upon to further extend its functionality and improve accountability within the organization, such as documenting transactions with customers as well as logging more information about different entities in the database.

Taking these opportunities into consideration, we undertook four different goals in order to deliver a complete solution to the client.

A. Database Model Update

Motivation

On analysis of the business processes of the company, it was felt that the current database model needed to be extended and modified in order to further meet the needs of the company:

- Inclusion of handling, delivery, and other associated charges for services rendered transporting cargo to consignees.

  The consultants learnt that handling, delivery, and other charges related to transferring cargo were stored in only two places—the receipt given to the customer and the bill of lading. Such charges were often annotated by an abbreviation and the amount.

  The accountant had to manually look at both documents in order to deduce what line items were charged to the customer so that she could write an accurate invoice. This process was cumbersome when line items on the bill of lading did not match up with line items on the pricing spreadsheet, or when documentation of handling was missing entirely, and handling charges had to be reverse engineered.

- Eliminating potential ambiguity as well as providing flexibility for data entry.

  In the preexistent solution, containers were related to voyages indirectly through a hatch log activity. Containers, then, were primarily identified by their container numbers and secondarily through the hatch log activity that they were associated with. Creating the hatch log created container records, thus a container could not be entered into the database until the paper hatch log has been written and entry of the hatch log into the information system had begun.

In addition, when queries were run on only the container table, there was room for ambiguity since the same container/container number travels on multiple voyages.

- Simplification of the database design to make it easier to understand and use.

The distinction between container cargo and break-bulk cargo, with characteristics of their contents stored in separate tables in the preexistent database, was deemed unnecessary.

It was also learnt that certain aspects of the preexistent information system were not needed. These aspects were in disuse and cluttered the user interface. A paper delivery authorization form is used in the organization internally to communicate to the forklift operator that certain cargo has been authorized for delivery. However, the form is only used internally and is not needed again. Thus, it was deemed unnecessary to record this information in the database.

Outcomes

The consultants undertook the following activities:

1. **Studied old database model and interviewed staff members**

The old database model and business processes documented in the summer 2017 consulting report gave the student consultants a head start on understanding what critical business processes needed to be supported by the solution. As the student consultants learned more about the business processes, they were constantly in touch with employees from relevant departments to identify all scenarios and edge cases that might arise. Then, it was checked whether the preexisting database model would support them.

On the basis of the preexisting entity-relationship diagram (ERD), a new ERD was developed through this process and was constantly modified until the consultants were confident that it would support all the scenarios identified.

Following were the key updates to the ERD:

- A direct relationship between containers and voyages was created to enable the addition of containers into the database before the ship lands, which is data that often comes well in advance of the voyage arrival. This would also enable adding bill of ladings and generating receipts for cargo handling services beforehand.
- The table for delivery authorizations was removed, as it was deemed unnecessary to digitize that part of the cargo delivery process.
- A table—tbCargoHandling—was added to support the business process consisting of consignees/importers coming to the front-desk to pay for handling/delivery services for their cargo. An accompanying auxiliary table was also added that would store charges for various services.
- The tables for storing details about the characteristics of contents of break-bulk and containers—tbBreakBulkContent and tbContainerContent—were combined into a single table—tbCargoContent—for simplicity.
- The cardinality between tables tbContainer and tbHatchLogActivity, as well as tables tbBreakBulk and tbHatchLogActivity, was changed from one-to-many to many-to-many in consultation with the staff. Junction tables were created to resolve these many-to-many relationships.

- New auxiliary tables were added to store names of vessels, employees, and receptionists.
- Several new fields were added to existing tables as and when their need was perceived.

Outputs

- Entity-relationship diagram (See Appendix B)

2. Created the database in Microsoft Access 2016

A database with all required tables and relationships was created again from scratch in Microsoft Access 2016 according to the new ERD developed. Throughout the duration of the consulting engagement, additional fields, validations, and macros were added when a need for them was perceived. The final solution consists of 8 main tables and 11 auxiliary tables, including 2 junction tables to resolve many-to-many relationships.

Main tables:

- tbVoyage: stores information about every ship that comes to the Port of Majuro to be loaded/unloaded and thus requiring MSTCo's services. Each voyage is identified by a vessel name and a voyage number, which is provided by the shipping agent.
- tbHatchLogActivity: stores information about activities performed during the stevedoring operation.
- tbContainer: stores key information about each container, like the container number and the voyage it arrived/departed on. This table can contain multiple records with the same container number, but which are associated with different voyages.
- tbBreakBulk: stores key information about loose cargo not contained in containers.
- tbCargoContent: stores information about the characteristics of the contents of both containers and break-bulk items associated with a specific operation activity, as per the bill of ladings.
- tbBillOfLading: stores information about the bill of ladings. Each bill of lading is identified by its bill of lading number.
- tbContainerMovementLog: stores information about the movement of containers from and to the container yard.
- tbCargoHandling: stores information about handling charges that consignees need to pay for each record in tbCargoContent before delivery.

Auxiliary tables:

- juncBreakBulkHatchLog: junction table to resolve the many-to-many relationship between break-bulk items and hatch log activities.
- juncContainerHatchLog: same as juncBreakBulkHatchLog, but for containers.
- tbAuxActivity: stores the names of stevedoring activities at the dock.
- tbAuxAgent: stores the names of shipping agents.
- tbAuxBusinessRules: stores values for storage business rules. This table facilitates parameterization of reports, so that updated business rules do not render reports obsolete.
- tbAuxConsignee: stores the names of consignees.
- tbAuxChecker: stores the names of checkers.

- tbAuxHandling: stores charges that are applied to cargo items for their handling and delivery, as well as charges for equipments used.
- tbAuxMSTCO: stores business contact information about MSTCo. This table ensures that these details can be kept up-to-date on reports.
- tbAuxReceptionist: stores the names of receptionists.
- tbAuxVessel: stores the names of ships.

Outputs

- Implementation of the entity-relationship diagram in Microsoft Access.

Recommendations

Ability to enter information about refrigerated containers' (refers) power consumption is not currently built into the system. Reefers need to plugged-in to power at the container yard for storage. Currently, the information about when the reefers are connected and disconnected is recorded manually. Charges are then calculated later using an Excel spreadsheet. Adding this component to the solution can simplify calculating reefer plug-in charges and provide easy access to this data.

To implement this feature, a new table has been added to the database model. A front-end form needs to be added to the current user interface and reports needed to be designed.

In addition, there are a number of peripheral MSTCO business processes that could be encoded that were out of our scope. Aside from refer plug in, this list includes:

- Invoicing
- Tent & Equipment rentals
- Salt storage
- Employee information and contact

B. Database Usability Update

Motivation

The 2017 front end implementation for the database had been split into 3 separate entities with exclusive abilities. While the division of abilities was rational—Accounting, Billing & Collections, and Yard Control—the actual implementation was hard to navigate, confusing, and was not very accommodating in terms of usability:

- Creating a more hierarchical application structure and re-distributing abilities for different classes of users.

One of the largest issues with the old system was the difficulty in finding where different actions were located. In addition to actions being split into three distinct files, the way in which actions were sorted were also not completely intuitive.

For example, the Billing & Collections dashboard contained forms for creating and viewing bill of ladings. If one wanted to edit a bill of lading, however, they would need to open up the Accounting dashboard instead.

- Making the user interface flexible to users' needs.

In the preexisting solution, certain assumptions were made about the business processes that reflected on how different parts of the application should be used and in which order. For instance, it was assumed that the hatch log would be the first piece of data regarding a voyage that would be entered, and thus voyage creation was grouped together with hatch log creation.

This in turn restricted the ability to enter any other information, such as bill of ladings, which often arrive in advance, until after the hatch log had been written and entered into the system. As such, implementing new business practices of obtaining and entering data prior to a ship's arrival becomes impossible without a front-end overhaul.

Assumptions made on what information was needed from the system were also not ideal. Included in the 2017 user interface were a variety of reports as well as a few data tables with very specific information. However, the Microsoft Access run-time version, which is available to install for free, lacks access to data tables and queries. So, there was no way to obtain a simple list of all voyages, for instance, and easily look up related information. As such, being unable to easily access trivial data created user frustration.

Outcomes

The following actions were taken to achieve the goal of revising the frontend:

1. **Determined application organization, structure, and requirements.**

A new user interface draft was created, with a layout and structure similar to a website, a familiar concept for most users. This consisted of a homepage, navigation bar, and different pages containing more specific actions.

The different sections of the application were decided on largely based on dividing up abilities from the previous iteration as well as new abilities deemed necessary. It consists of the following categories:

- Home Page

Since voyages are the basis of all operations at MSTCo, information and abilities pertaining to voyages were placed on the home page, which every user sees upon opening the application.

Additionally, incomplete information is also visible on the home page in order to remind users to retroactively complete records when they have the relevant information.

- Yard Control

The yard control section still retains most of its functionality from the previous version. In addition to container movements and hatch log entry/editing, it now also has the ability to add containers and break bulk prior to ship arrival.

- Reception

Reception is where the new functionality of documenting handling charges now belongs. Users can select a bill of lading and add handling charges to its various cargo, which the system will tally up and generate a receipt and transaction for.

- Accounting

Accounting consolidates abilities from the old Billing & Collections dashboard as well as the old Accounting dashboard. It has the ability to add and edit bill of ladings as well as to generate reports

- Data

The data section is a more accessible format for general users to easily interface with the existing data in the database.

2. Created forms to interface with database backend.

Forms were created as per design in the previous step (Appendix A). Majority of the engagement was spent developing and testing the forms. Once completed, limited front-ends for reception as well as yard control were created, so that users only have access to those abilities that their job descriptions were concerned with.

Outcomes

- Limited front-end interface for checkers.
- Limited front-end interface for receptionists.
- Full front-end interface for the accountant and the database manager.

3. Performed user tests and deployed interface to respective users.

The student consultants began user tests the first voyage of July, and in the process found software bugs and lapses in the design. The consultants additionally found ways to make the user interface more user-friendly. For example, auto-filling fields that usually remain the same for a number of records during data entry, on the basis of the last record entered, makes data entry less burdensome and frustrating.

The information system was rolled out to all users in mid July after user testing had been completed. The full frontend was placed on the computers for database administrators and office assistants, yard control on the laptop for hatchlog entry as well as the computer in the checker's office, and reception on the computers by the front desk for helping customers. For the week of deployment, the consultants stayed at the reception and yard control work stations in order to help answer questions and ease the transition into the new system.

Outcomes

- Streamlined and user-friendly data-entry forms.
- Deployment of frontends to respective workstations

4. Incrementally updated and improved user interface.

Through the course of deployment, new features often needed to be added in order to handle unexpected challenges. Some of the updates include:

- Adding container number verification according to the ISO 6346 standard that container numbers adhere to.
- Increasing the ease of deleting hatch log activities in case of data entry mistakes.
- Adding default values to hatch log entry (start date/time, shift, etc) in order to speed up hatch log entry.

- Adding a prompt to edit the existing bill of lading when a duplicate bill of lading number is entered.
- Adding a "Checkout" button to reception which stores additional information about the payee, receptionist, and means of payment.
- Adding the ability to add a particular handling charge to all cargo under a bill of lading simultaneously.
- Adding the ability to generate container movement reports in the container movement section.
- Adding the ability to delete entries from the data section (given no dependent records).
- Adding additional filters via dropdowns and search boxes in data section .

Recommendations

While incremental changes were made after deployment, there were a number of improvements that were not made, either due to lack of scope or due to insufficient time at the end of the engagement. A few of the recommended changes include:

- Adding the means to search all bill of ladings by receipt/check number.
- Adding the means to easily change the associated voyage of a bill of lading and cascade change the voyage associations for all cargo contained within the bill of lading.
- Improving the workflow for outbound containers in which the voyage is not yet known.
- Integrating reefer container plug-in tracking.
- All business processes recommended in the Database Model Update section.

C. Database & Systems Trainings and Documentation

Motivation

Training was an important priority for this project because that is what was understood prevented the full utilization of the information system developed originally:

- With extensive training, the information system would become well-integrated into the business processes.

With continued proper use of the system, a speed-up in invoice generation for the shipping agents, which currently stands at around 3 weeks, was expected. This would also help the chief accountant get accurate summary reports during annual audits.

- Training would reduce the amount of human errors.

This would mean fewer shipping containers get lost and less digitization work is repeated.

- Specialized training for some employees about the database would ensure sustainability.

With continued use of the system, these employees would be better placed to understand and deal with problems that surface in the future in the form of cryptic error messages.

- Documentation of database systems and video tutorials increase (re)learnability of the system

Documenting how the system is built and structured enables users to learn more about the system and how to extend it if desired. In addition, documentation also helps preserve institutional

knowledge in the event of employee turnover and/or information loss. In addition, video tutorials were recorded in order for easier learning.

Outcomes

The consultants engaged in extensive supervised training as well cross-training to ensure that employee turnover doesn't result in lost technical knowledge related to usage of the information system:

1. **Specialized Database Design Training**

Two employees of the company, Cody and Sailass Stinnett, were educated on the benefits of a database system, how a database models business processes, and how the data is stored in a database system.

They were also trained on how to create queries, and on the importance of data integrity. Whenever a problem was faced with the database during the course of the engagement, these employees were encouraged to observe the process of fixing them.

2. **Front-end User Training**

Users of the database system were walked through how to perform tasks in the new frontend. After training users how to perform their roles in the new context, student consultants shadowed users for approximately a week in order to ensure proper usage of the information system.

3. **Documentation**

A quick start manual was created early on in order to give a crash course on how to use the information system. Nearing the end of the project, a more extensive database manual was written, and tutorial videos were created. Documentation materials are stored on the server in the same directory containing the database.

Recommendations

Regular usage of the database system should be sufficient to maintain a level of proficiency of the system. However, there currently no users trained with extending and fixing the user interface. Microsoft Access self-trainings are thus recommended in order to sustain the ability for continued development of the system.

In-person training of new employees is also recommended in order to retain institutional knowledge of the database system.

D. Miscellaneous Technology Updates

Motivation

Despite the primary objective of the consulting engagement being the database system, there were a number of other areas in which technology could be applied to improve business operations. In particular, there were three distinct goals that could be achieved within the engagement period:

- Business Intelligence

Although the new information system streamlined data extraction, there was still no way for the management to get a high-level overview of the status of business operations. A business intelligence solution would provide the management with a convenient and easy way to

monitor the business operations and would allow them to make informed business decisions.

- Automatic Receipt Generation

MSTCo had a receipt printer for the reception for a long but it was never integrated. The accountant requested the receipt printer be used at reception to print receipts for customers.

- Making Data Backups

The accounting data is located on the server but is not backed up. In the instance that files are accidentally deleted or corrupted, they are impossible to recover. The managing director has a network attached storage (NAS) device in his office which is configured to store security video footage by the company's IT support firm. Backing up accounting data along with a backup of the database, then, would be a relatively simple yet greatly beneficial action for MSTCo.

Outcomes

1. The Power BI business intelligence tool was rehauled.

The management can now access reports with various charts that depict information about the business operations. Having immediate access to aggregate data about voyages, containers and consignees provides a high-level sense about the current health of the business. Secondarily, with such a utility in place, the management can conveniently oversee the proper usage of the information system and thus continue to benefit from it.

2. A receipt printer was integrated into the reception workflow.

The receipt printer was hooked up to the computer used from reception. Drivers were installed on the computer and it was hooked up to the cashbox and configured to open upon printing a receipt. The frontend was additionally configured to generate and print receipts to the receipt printer

3. Backup of accounting data to the network-attached storage device.

The company Pacific Core Inc., which handles MSTCo's networking and technological needs, agreed to help set up a live backup of the accounting data to main NAS. In addition, Pacific Core Inc. was also requested to look into backing up the NAS to the managing director's OneDrive cloud storage for an off-site backup.

Recommendations

1. Continuous monitoring of the information system through Power BI reports.

With the charts available on the Power BI, the management can routinely check that data is being entered into the information system regularly. This can be very effective in ensuring proper usage of the solution and in reducing backlogs.

2. Teaching the database administrator on how to restore data from backups.

It is possible that database front-end files or even the database back-end file be accidentally deleted or corrupted. In such a scenario, it would greatlythe database adminis

IX. Additional Recommendations

Training of Database Administrator in Microsoft Access

While the database administrator was trained in database design, the scope of engagement prevented was not sufficient for a thorough training in developing the front end.

As the engagement period was relatively short, not every request to improve the front end was accounted for. Having a dedicated employee to extend upon the information system would increase the longevity of the solution and be able to support business practices as they evolve. In addition, having a knowledgeable employee would help in both fulfilling recommendations for system upgrades as well as introducing future consultants and external entities on the workings and design of the information system.

The following course of actions is recommended to train oneself in Microsoft Access as well as the design of the front-end.

1. Consuming training materials to gain basic understanding of Microsoft Access.

Multiple resources exist online and locally to gain a broad understanding of the workings of Microsoft Access. On the database is the document "Microsoft Access for Dummies", which provide a brief overview on the capabilities of Microsoft Access. The chapters on "Forms" are relevant for extending the front end. In addition, a short tutorial video created by the consultants on the basics of form design is also on the database.

2. Making small, quality of life changes on existing forms/components.

One example of a small quality of life change is adding the ability to filter bill of ladings by receipt number in the data tab. Multiple video tutorials exist online on how to implement simple filtering and control elements.

The recommended method creating change is to duplicate the frontend file onto the user's local machine, and to reupload and replace the older version when the new functionality has been tested to work.

3. Creating new forms and integrating them into the current front-end.

One example is a form that shows payment information, and all bill of ladings associated. Such a form could be integrated similarly to the manner "Container Single" is implemented.

4. Altering the design of front-end to support new business processes.

Once a solid handle is established on how to create and work with forms, the database administrator will be better prepared to sustain the solution as business needs change.

Full Integration of MSTCO Business Practices into Database Information System

As noted in the recommendations section for database model and usability update, not all business processes are currently integrated into the database information system. Due to the limited engagement period, a full integration of business practices was out of scope so more critical business practices were focused on.

A full integration provides numerous advantages over a partial integration:

- Partial integrations often result in confusing workflows which result in a higher amount of errors. Such an instance may occur when a consignee pays for a tent rental and equipment

handling under the same check, and multiple lookups and cross checks in different information systems would be required in order to retroactively understand the transactions that took place.

- Full integration means digitization of paper system which increases ease of look up and correcting of records. In addition, calculations can be automated to reduce human error. Such an instance is calculating charges for reefer plug-ins, in which the daily and hourly rate are different, and both are often used in conjunction.

The best means of achieving this goal is to train a dedicated employee to sustain and extend the system. Majuro does have a couple technology consultants, but are mostly oriented towards other needs and may not pick up a project so specific and outside of their domain. Pacific Core, for instance, specializes mostly in networking. Marc, the accounting consultant, is similarly well versed in accounting. While both are undoubtedly experts in their field, neither would be recommended to extend this specific project. Technology Consulting in the Global Community is a cheap and thorough option to return to, but restrains such as fixed engagement period potentially means the project is unable to be taken to completion similarly to this and the previous engagement.

About the Consultants

Aditya Chanana is a junior in Information Systems with a minor in Computer Science at Carnegie Mellon University. After participating in the Technology Consulting in the Global Community program he will return to Pittsburgh to spend the next two years working towards the completion of his degree.

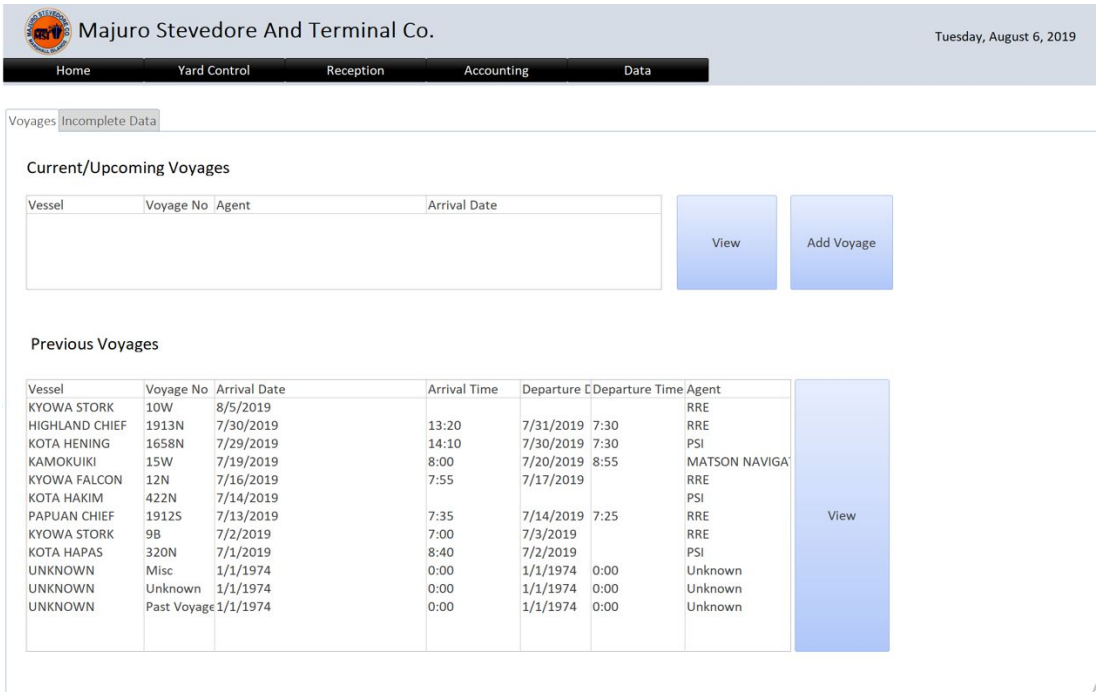
Ryan Eckert is a senior in Information Systems at Carnegie Mellon University additionally pursuing minors in Computer Science and Game Design. Ryan will return to Pittsburgh for his last year in the undergraduate program before pursuing a career in game development.

Appendices

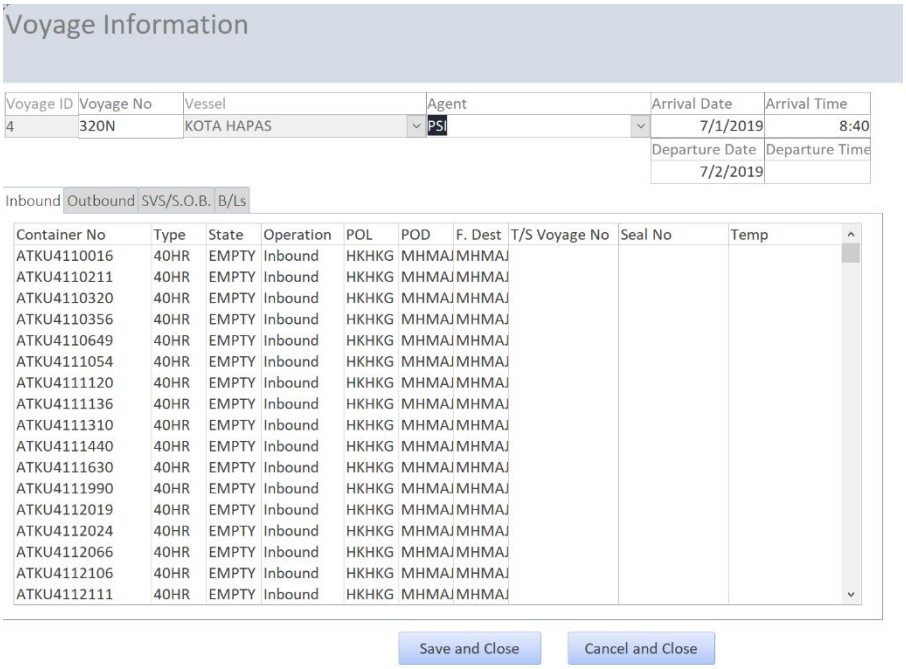
Appendix A: Screenshots of User Interfaces

Home Page

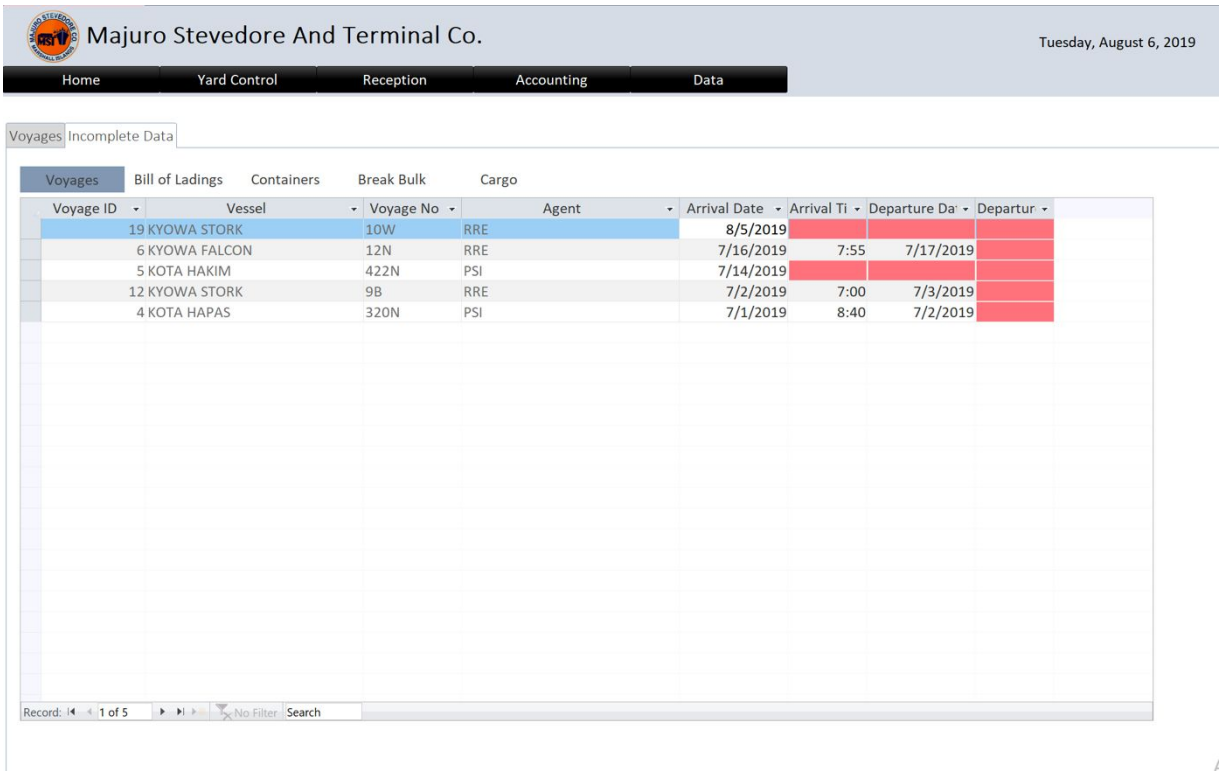
1. Includes a list of upcoming, current, and previous voyages.



2. On double clicking a voyage in the list, the user is shown more details about the voyage, and lists of associated containers and bill of ladings. The user can easily edit voyage related information like arrival and departure dates and times.

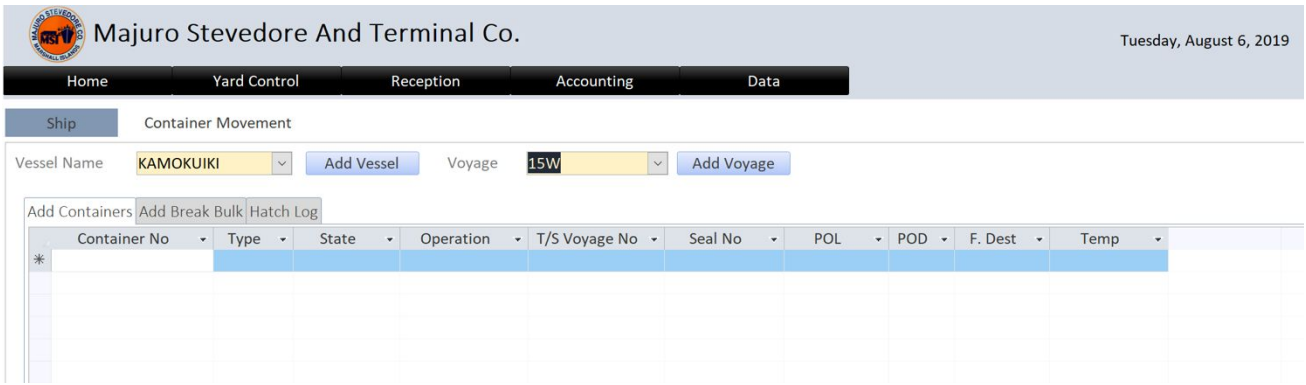


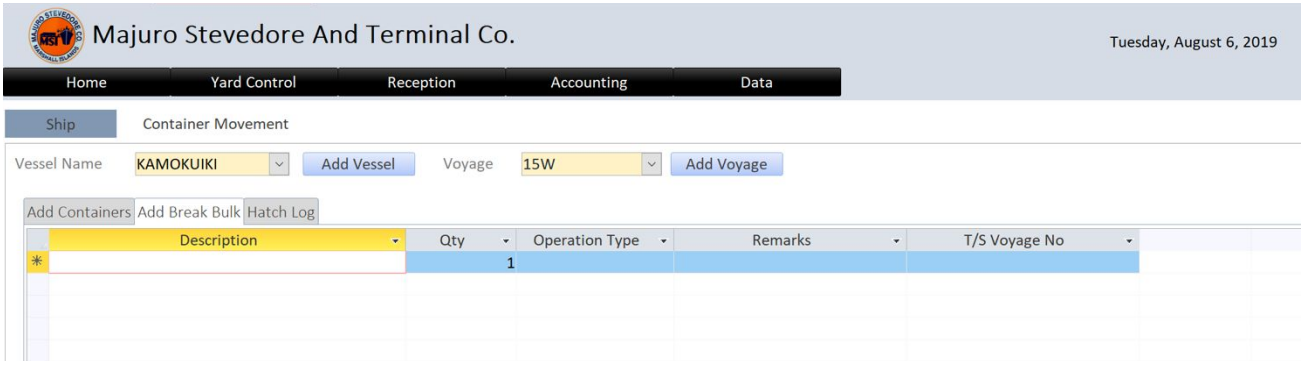
3. The home page also includes an *Incomplete Data* tab that presents records from voyages, bill of ladings, containers, and so on that have fields that have not been entered, perhaps because the information was not available initially. This tab provides the user with a convenient way to enter that information when it becomes available.

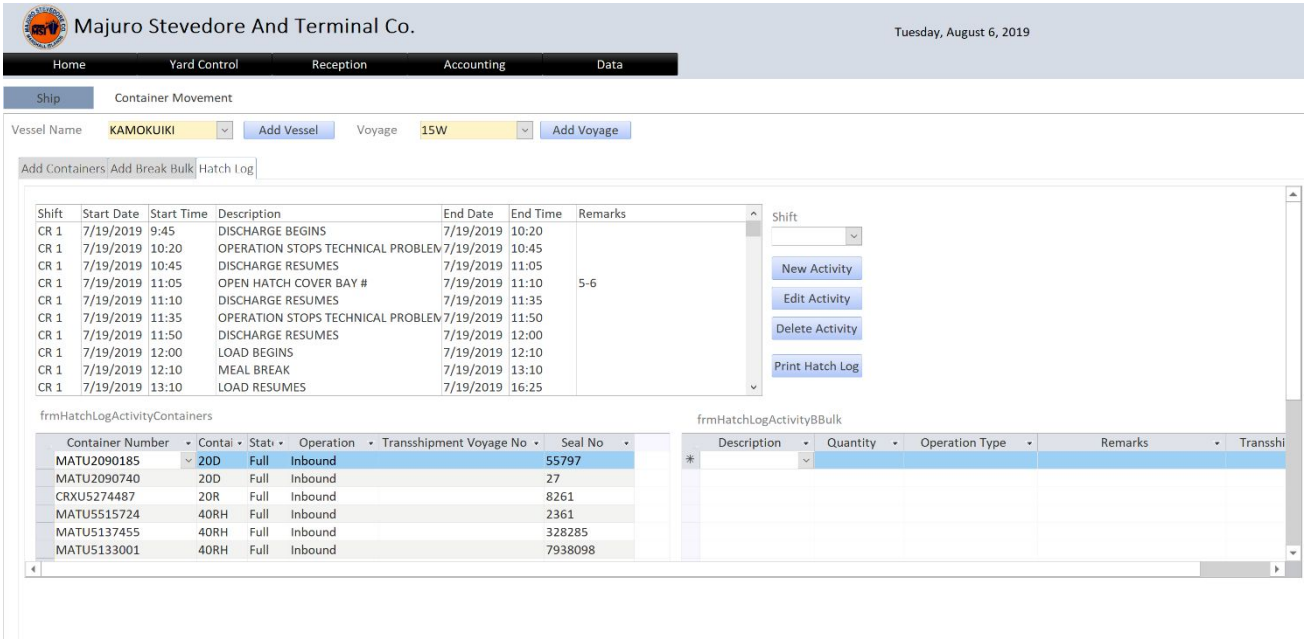


Yard Control

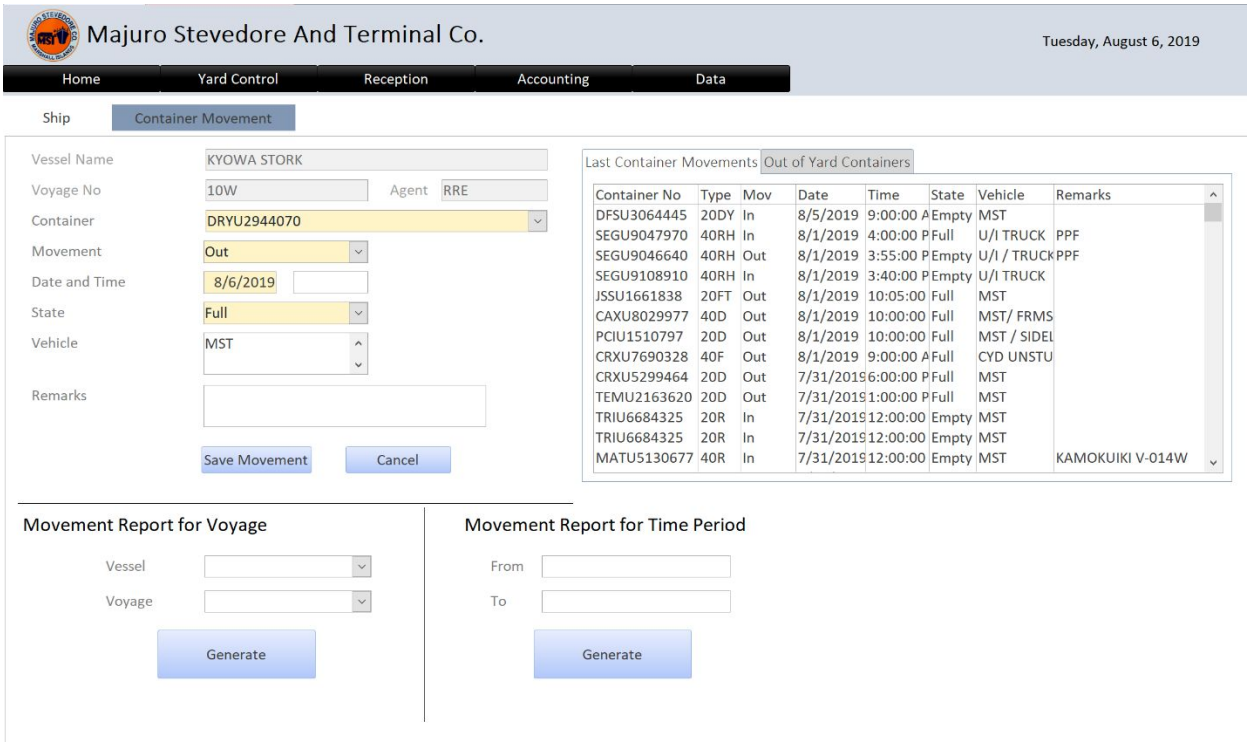
1. Contains two subsections—*Ship* and *Container Movement*.
2. The *Ship* subsection includes all features related to cargo ship voyages like adding containers, break bulk and hatch logs for a voyage. By entering information about containers and break bulk in advance, users can easily select containers from drop-down menus when creating bill of ladings or entering hatch log activities into the system.





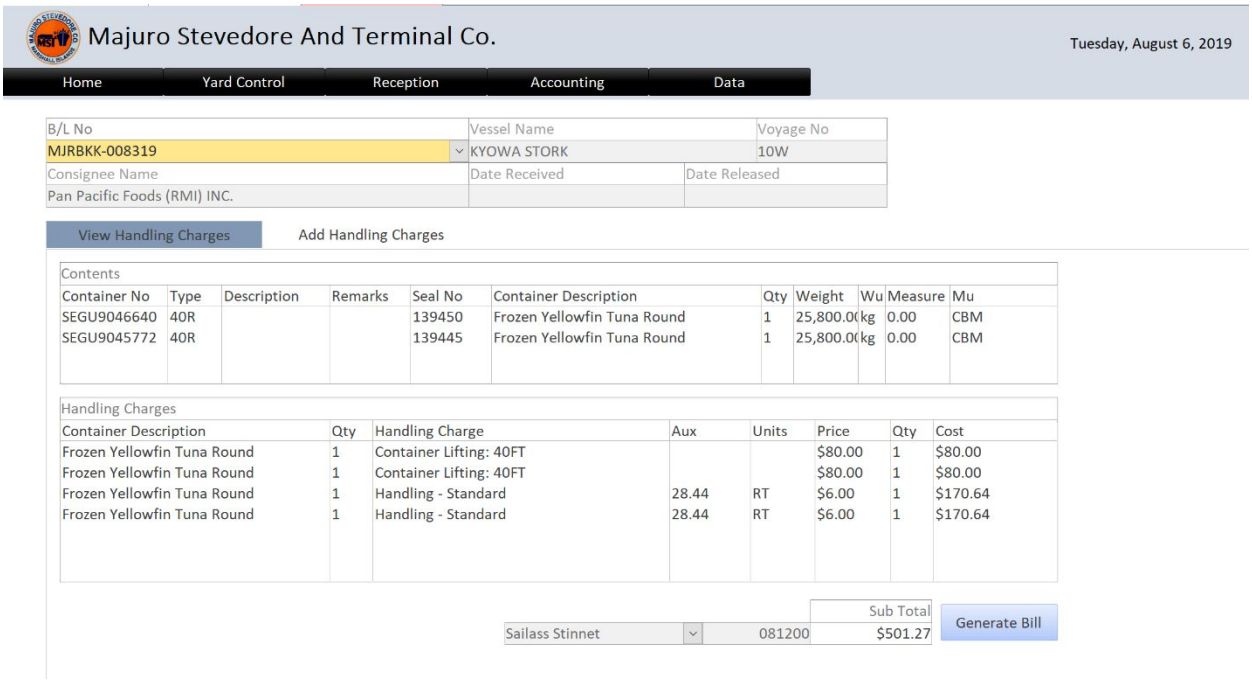


3. The *Container Movement* subsection allows the user to enter container movements in and out of the container yard. It also allows the user to generate container movement reports.



Reception

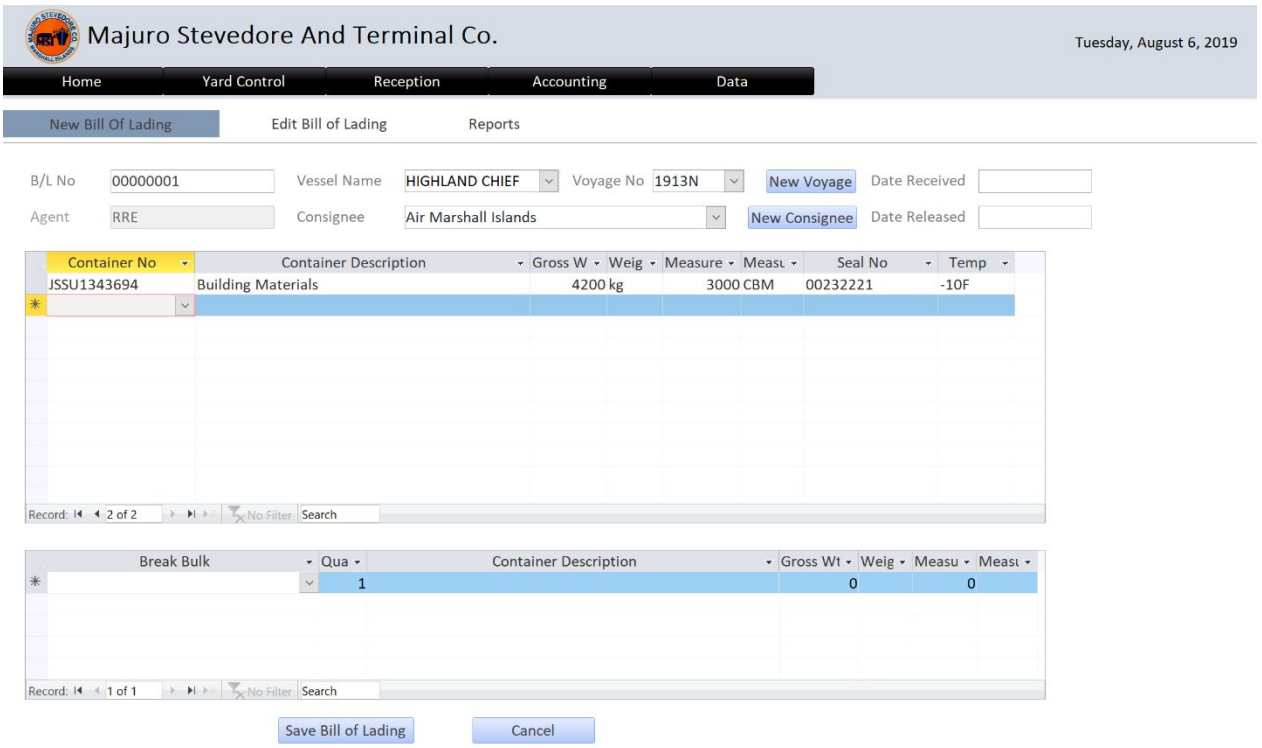
1. The reception is where handling charges are added for containers and break bulk for a particular bill of lading, and then a payment receipt is generated for the consignees. This page allows the user to select a bill of lading from a drop down list and auto-populates the cargo associated with the bill of lading along with their weight and measure details.

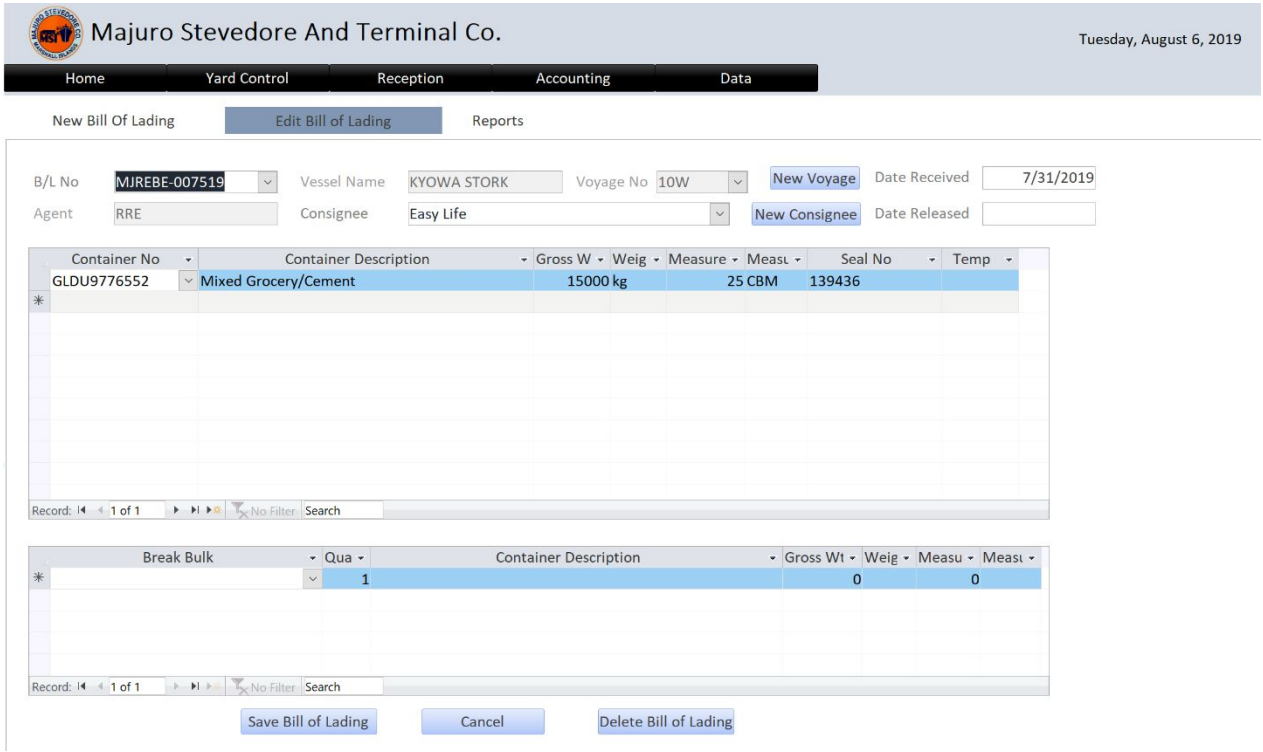


2. Once handling charges have been added for a bill of lading, the user can click on the *Generate Bill* button to add further details about the transaction, and to finally generate a payment receipt.

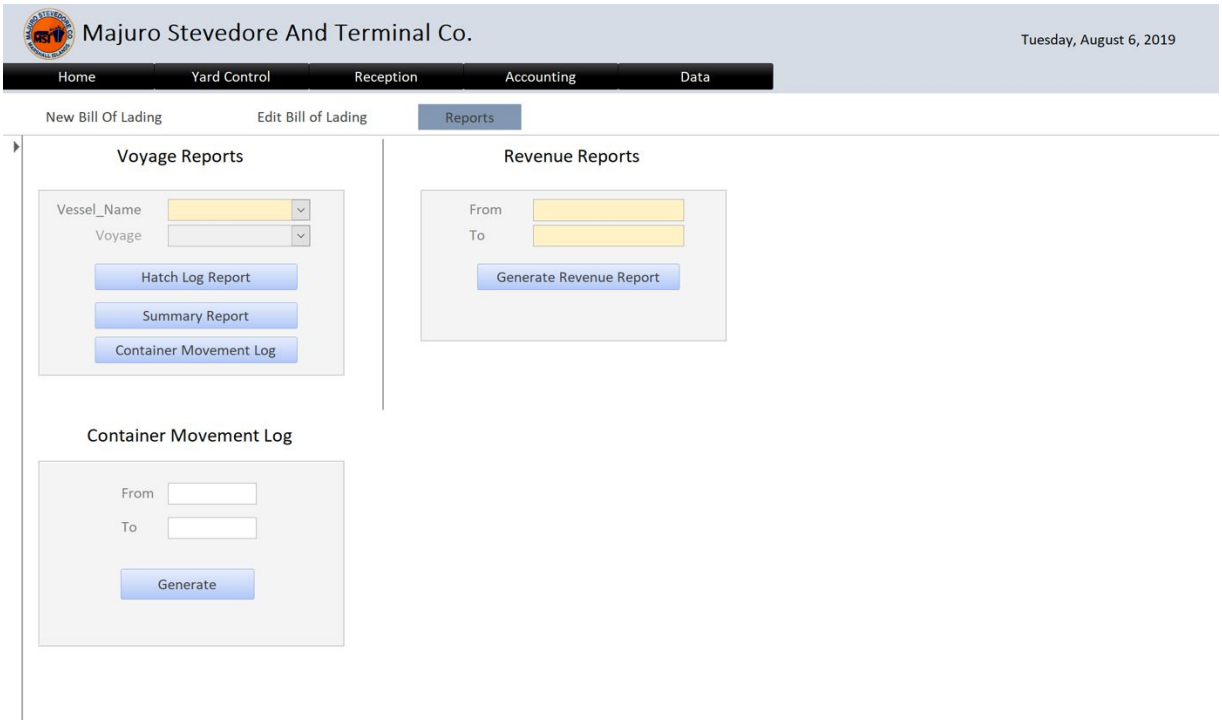
Accounting

1. Accounting is where new bill of ladings can be added to system or existing ones can be edited.



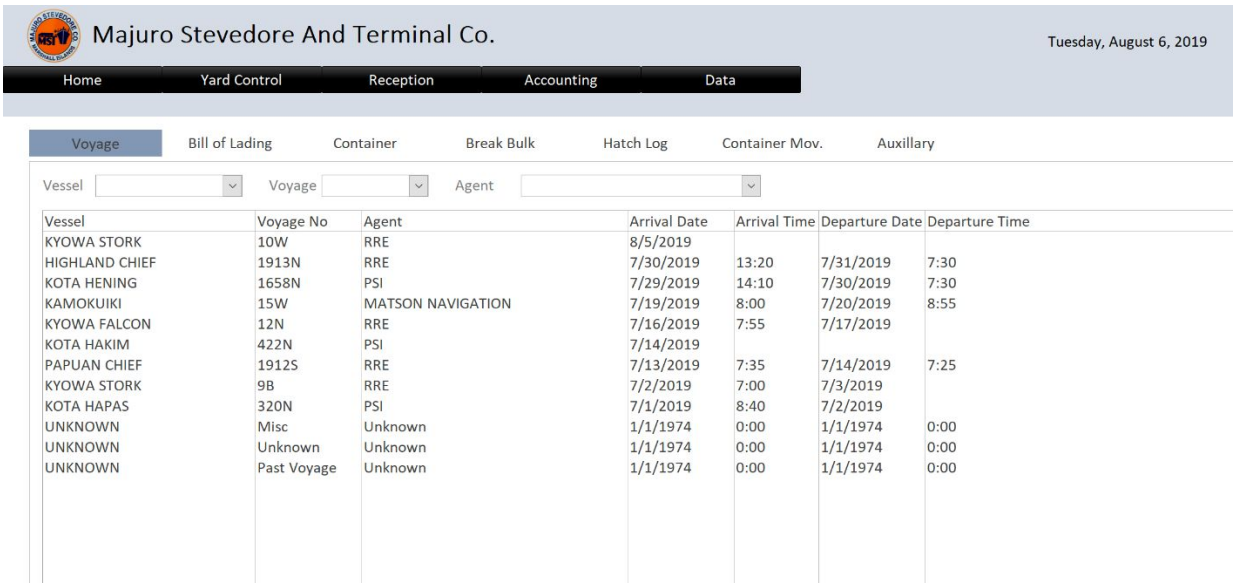


2. Here, users can also generate various reports related to voyages and containers.

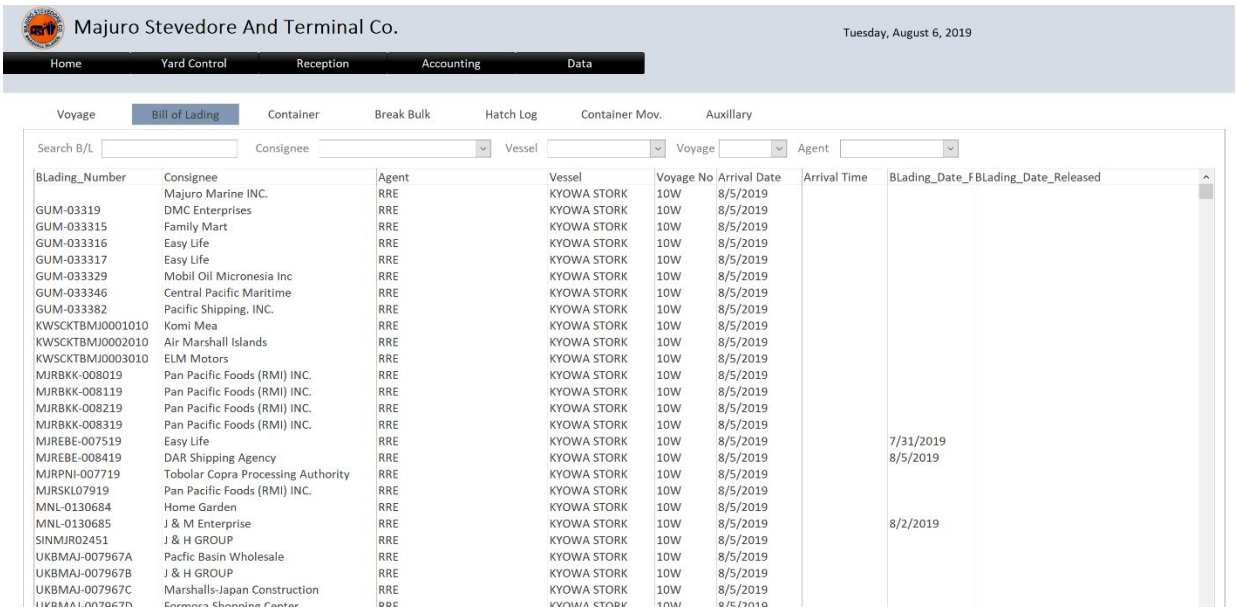


Data

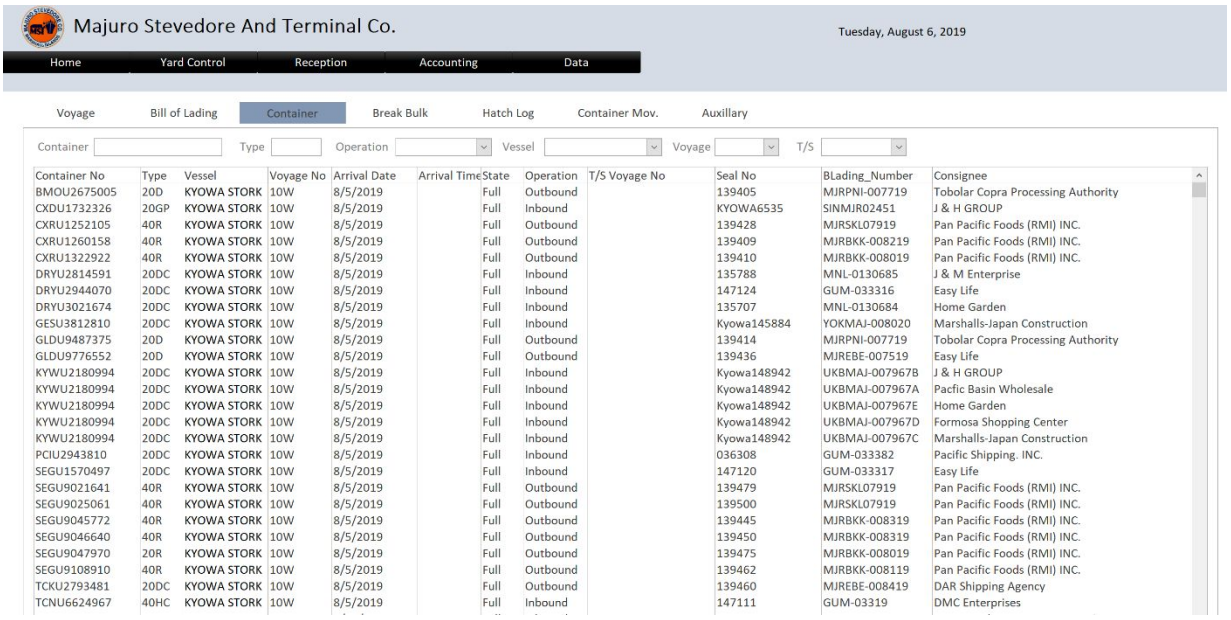
1. The data section provides a way for users to retrieve information about voyages, containers, bill of ladings, etc. by searching for them using a field.



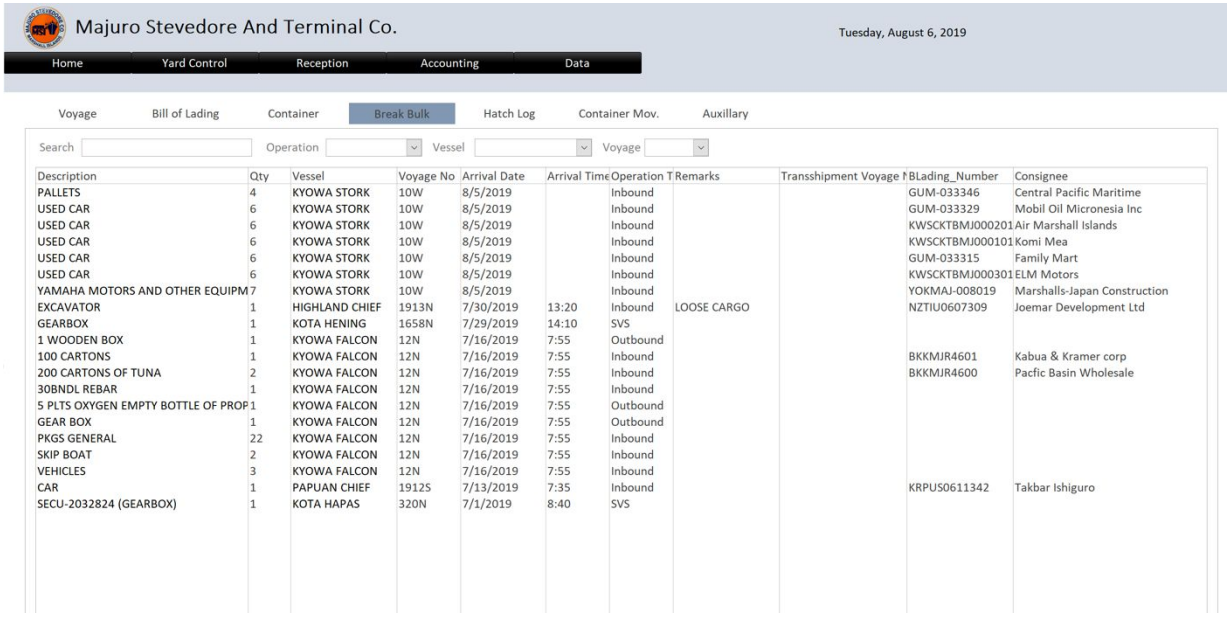
Vessel	Voyage No	Agent	Arrival Date	Arrival Time	Departure Date	Departure Time
KYOWA STORK	10W	RRE	8/5/2019			
HIGHLAND CHIEF	1913N	RRE	7/30/2019	13:20	7/31/2019	7:30
KOTA HENING	1658N	PSI	7/29/2019	14:10	7/30/2019	7:30
KAMOKUIKI	15W	MATSON NAVIGATION	7/19/2019	8:00	7/20/2019	8:55
KYOWA FALCON	12N	RRE	7/16/2019	7:55	7/17/2019	
KOTA HAKIM	422N	PSI	7/14/2019			
PAPUAN CHIEF	1912S	RRE	7/13/2019	7:35	7/14/2019	7:25
KYOWA STORK	9B	RRE	7/2/2019	7:00	7/3/2019	
KOTA HAPAS	320N	PSI	7/1/2019	8:40	7/2/2019	
UNKNOWN	Misc	Unknown	1/1/1974	0:00	1/1/1974	0:00
UNKNOWN	Unknown	Unknown	1/1/1974	0:00	1/1/1974	0:00
UNKNOWN	Past Voyage	Unknown	1/1/1974	0:00	1/1/1974	0:00



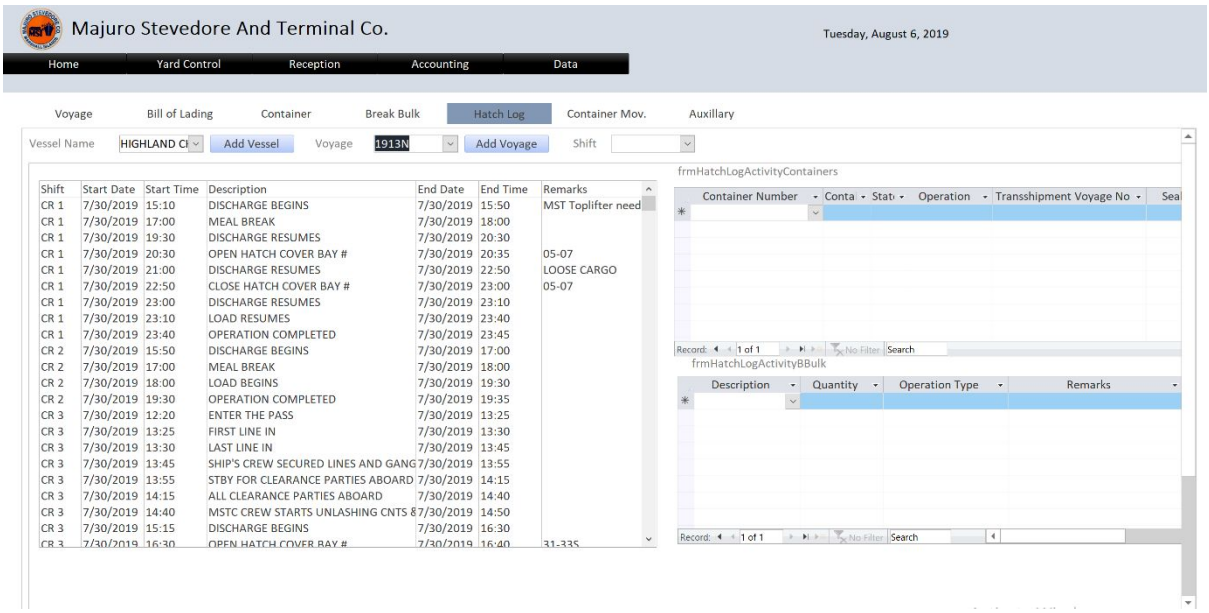
BLading_Number	Consignee	Agent	Vessel	Voyage No	Arrival Date	Arrival Time	BLading_Date_F	BLading_Date_Released
	Majuro Marine INC.	RRE	KYOWA STORK	10W	8/5/2019			
GUM-03319	DMC Enterprises	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033315	Family Mart	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033316	Easy Life	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033317	Easy Life	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033329	Mobil Oil Micronesia Inc	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033346	Central Pacific Maritime	RRE	KYOWA STORK	10W	8/5/2019			
GUM-033382	Pacific Shipping. INC.	RRE	KYOWA STORK	10W	8/5/2019			
KWSCKTBMJ0001010	Komi Mea	RRE	KYOWA STORK	10W	8/5/2019			
KWSCKTBMJ0002010	Air Marshall Islands	RRE	KYOWA STORK	10W	8/5/2019			
KWSCKTBMJ0003010	ELM Motors	RRE	KYOWA STORK	10W	8/5/2019			
MJRBKK-008019	Pan Pacific Foods (RMI) INC.	RRE	KYOWA STORK	10W	8/5/2019			
MJRBKK-008119	Pan Pacific Foods (RMI) INC.	RRE	KYOWA STORK	10W	8/5/2019			
MJRBKK-008219	Pan Pacific Foods (RMI) INC.	RRE	KYOWA STORK	10W	8/5/2019			
MJRBKK-008319	Pan Pacific Foods (RMI) INC.	RRE	KYOWA STORK	10W	8/5/2019			
MJREBE-007519	Easy Life	RRE	KYOWA STORK	10W	8/5/2019		7/31/2019	
MJREBE-008419	DAR Shipping Agency	RRE	KYOWA STORK	10W	8/5/2019		8/5/2019	
MJRPNI-007719	Tobolar Copra Processing Authority	RRE	KYOWA STORK	10W	8/5/2019			
MJRSKL07919	Pan Pacific Foods (RMI) INC.	RRE	KYOWA STORK	10W	8/5/2019			
MNL-0130684	Home Garden	RRE	KYOWA STORK	10W	8/5/2019			
MNL-0130685	J & M Enterprise	RRE	KYOWA STORK	10W	8/5/2019		8/2/2019	
SINMJR02451	J & H GROUP	RRE	KYOWA STORK	10W	8/5/2019			
UKBMAJ-007967A	Pacfic Basin Wholesale	RRE	KYOWA STORK	10W	8/5/2019			
UKBMAJ-007967B	J & H GROUP	RRE	KYOWA STORK	10W	8/5/2019			
UKBMAJ-007967C	Marshalls-Japan Construction	RRE	KYOWA STORK	10W	8/5/2019			

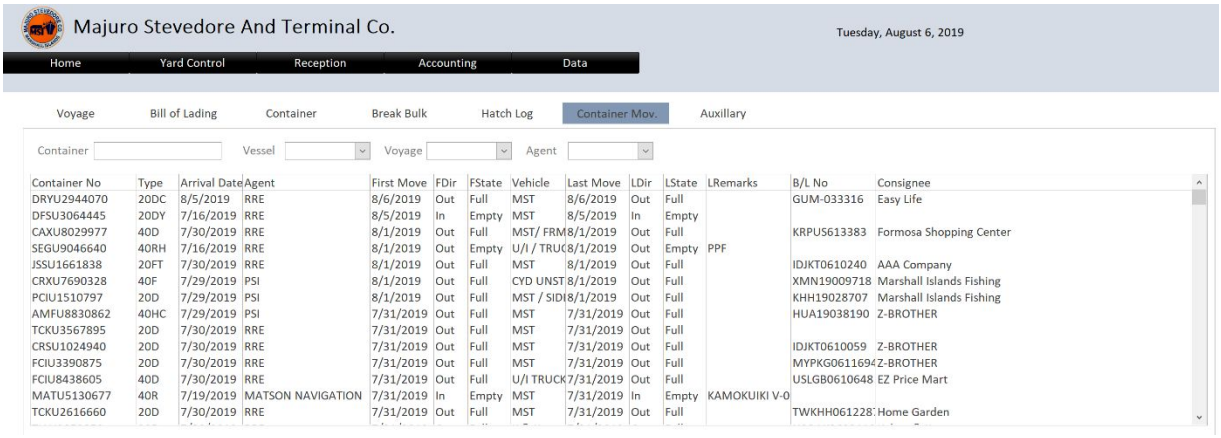


Container No	Type	Vessel	Voyage No	Arrival Date	Arrival Time	State	Operation	T/S Voyage No	Seal No	BLading_Number	Consignee
BMOU2675005	20D	KYOWA STORK	10W	8/5/2019		Full	Outbound		139405	MJRPNI-007719	Tobolar Copra Processing Authority
CXDU1732326	20GP	KYOWA STORK	10W	8/5/2019		Full	Inbound		KYOWA6535	SINMJR02451	J & H GROUP
CXRU1252105	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139428	MJRSKL07919	Pan Pacific Foods (RMI) INC.
CXRU1260158	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139409	MJRBKK-008219	Pan Pacific Foods (RMI) INC.
CXRU1322922	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139410	MJRBKK-008019	Pan Pacific Foods (RMI) INC.
DRYU2814591	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		135788	MNL-0130685	J & M Enterprise
DRYU2944070	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		147124	GUM-033316	Easy Life
DRYU3021674	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		135707	MNL-0130684	Home Garden
GESU3812810	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa145884	YOKMAJ-008020	Marshalls-Japan Construction
GLDU9487375	20D	KYOWA STORK	10W	8/5/2019		Full	Outbound		139414	MJRPNI-007719	Tobolar Copra Processing Authority
GLDU9776552	20D	KYOWA STORK	10W	8/5/2019		Full	Outbound		139436	MJREBE-007519	Easy Life
KYWU2180994	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa148942	UKBMAJ-007967B	J & H GROUP
KYWU2180994	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa148942	UKBMAJ-007967A	Pacfic Basin Wholesale
KYWU2180994	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa148942	UKBMAJ-007967E	Home Garden
KYWU2180994	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa148942	UKBMAJ-007967D	Formosa Shopping Center
KYWU2180994	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		Kyowa148942	UKBMAJ-007967C	Marshalls-Japan Construction
PCIU2943810	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		036308	GUM-033382	Pacific Shipping. INC.
SEGU1570497	20DC	KYOWA STORK	10W	8/5/2019		Full	Inbound		147120	GUM-033317	Easy Life
SEGU9021641	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139479	MJRSKL07919	Pan Pacific Foods (RMI) INC.
SEGU9025061	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139500	MJRSKL07919	Pan Pacific Foods (RMI) INC.
SEGU9045772	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139445	MJRBKK-008319	Pan Pacific Foods (RMI) INC.
SEGU9046640	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139450	MJRBKK-008319	Pan Pacific Foods (RMI) INC.
SEGU9047970	20R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139475	MJRBKK-008019	Pan Pacific Foods (RMI) INC.
SEGU9108910	40R	KYOWA STORK	10W	8/5/2019		Full	Outbound		139462	MJRBKK-008119	Pan Pacific Foods (RMI) INC.
TCKU2793481	20DC	KYOWA STORK	10W	8/5/2019		Full	Outbound		139460	MJREBE-008419	DAR Shipping Agency
TCNU6624967	40HC	KYOWA STORK	10W	8/5/2019		Full	Inbound		147111	GUM-03319	DMC Enterprises



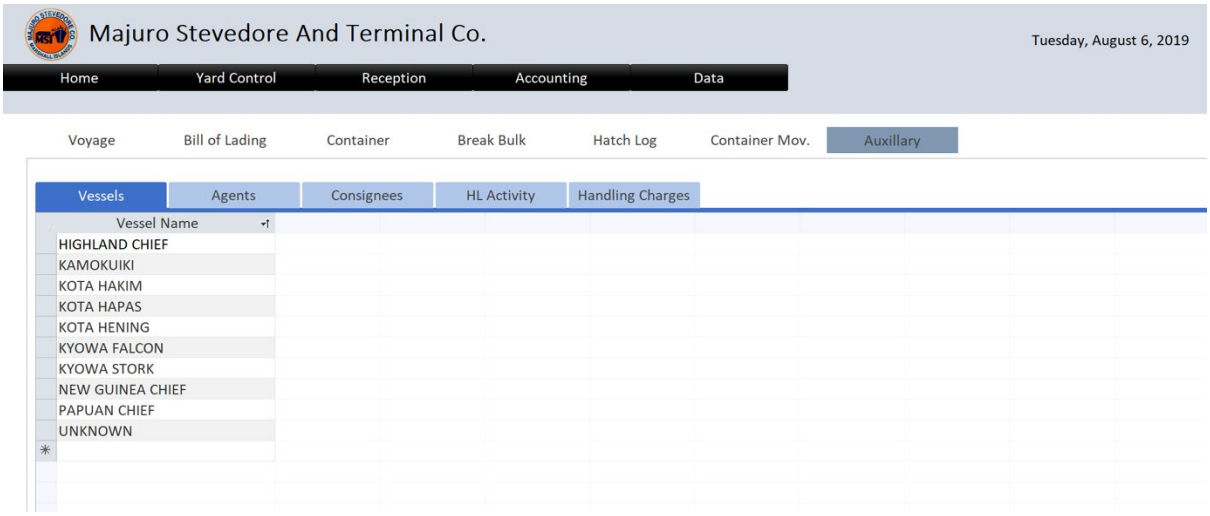
Description	Qty	Vessel	Voyage No	Arrival Date	Arrival Time	Operation T	Remarks	Transshipment Voyage N	BLading_Number	Consignee
PALLETS	4	KYOWA STORK	10W	8/5/2019		Inbound			GUM-033346	Central Pacific Maritime
USED CAR	6	KYOWA STORK	10W	8/5/2019		Inbound			GUM-033329	Mobil Oil Micronesia Inc
USED CAR	6	KYOWA STORK	10W	8/5/2019		Inbound			KWSCKTBMJ000201	Air Marshall Islands
USED CAR	6	KYOWA STORK	10W	8/5/2019		Inbound			KWSCKTBMJ000101	Komi Mea
USED CAR	6	KYOWA STORK	10W	8/5/2019		Inbound			GUM-033315	Family Mart
USED CAR	6	KYOWA STORK	10W	8/5/2019		Inbound			KWSCKTBMJ000301	ELM Motors
YAMAHA MOTORS AND OTHER EQUIPM	7	KYOWA STORK	10W	8/5/2019		Inbound			YOKMAJ-008019	Marshalls-Japan Construction
EXCAVATOR	1	HIGHLAND CHIEF	1913N	7/30/2019	13:20	Inbound	LOOSE CARGO		NZTIU0607309	Joemar Development Ltd
GEARBOX	1	KOTA HENING	1658N	7/29/2019	14:10	SVS				
1 WOODEN BOX	1	KYOWA FALCON	12N	7/16/2019	7:55	Outbound				
100 CARTONS	1	KYOWA FALCON	12N	7/16/2019	7:55	Inbound			BKKMJR4601	Kabua & Kramer corp
200 CARTONS OF TUNA	2	KYOWA FALCON	12N	7/16/2019	7:55	Inbound			BKKMJR4600	Pacfic Basin Wholesale
30BNDL REBAR	1	KYOWA FALCON	12N	7/16/2019	7:55	Inbound				
5 PLTS OXYGEN EMPTY BOTTLE OF PROP	1	KYOWA FALCON	12N	7/16/2019	7:55	Outbound				
GEAR BOX	1	KYOWA FALCON	12N	7/16/2019	7:55	Outbound				
PKGS GENERAL	22	KYOWA FALCON	12N	7/16/2019	7:55	Inbound				
SKIP BOAT	2	KYOWA FALCON	12N	7/16/2019	7:55	Inbound				
VEHICLES	3	KYOWA FALCON	12N	7/16/2019	7:55	Inbound				
CAR	1	PAPUAN CHIEF	1912S	7/13/2019	7:35	Inbound			KRPUS0611342	Takbar Ishiguro
SECU-2032824 (GEARBOX)	1	KOTA HAPAS	320N	7/1/2019	8:40	SVS				

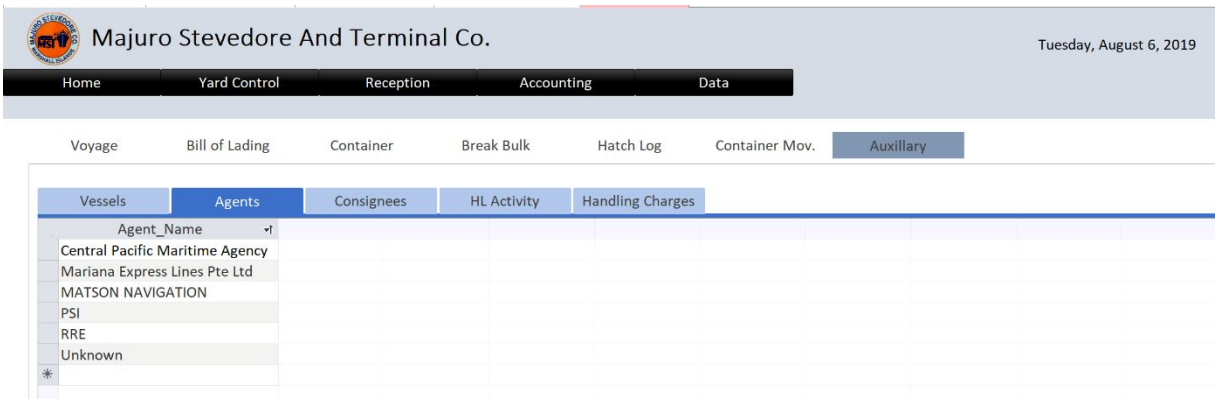


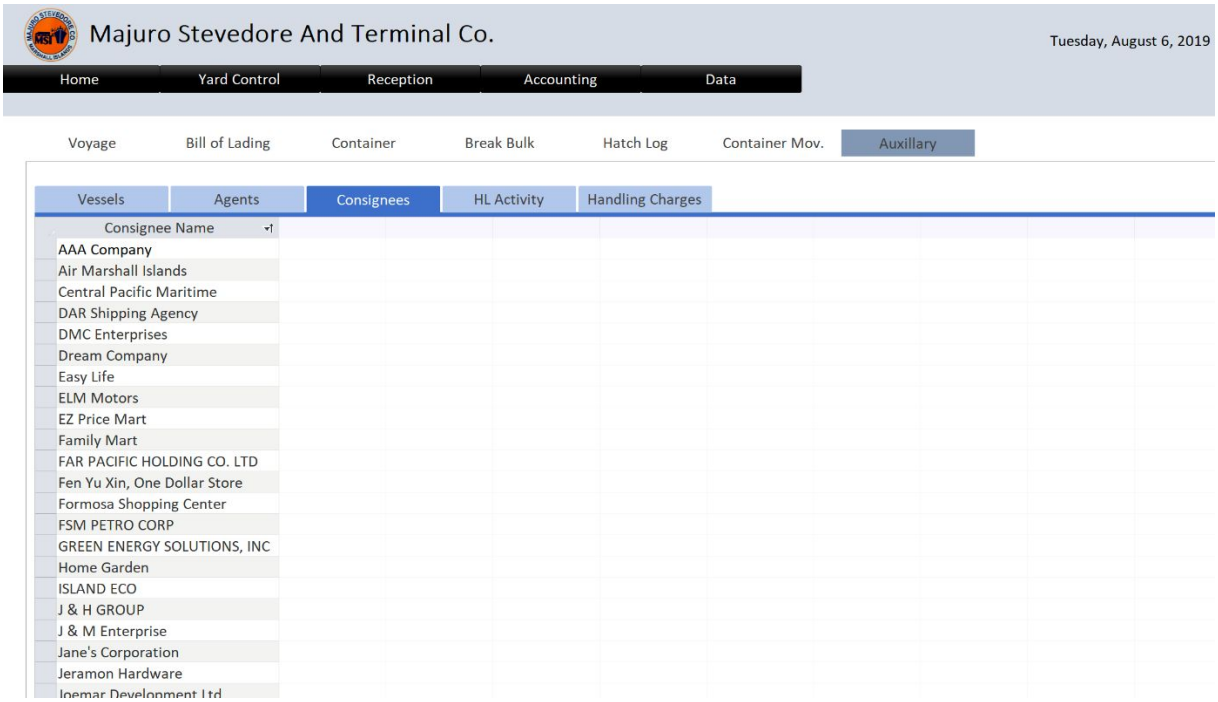


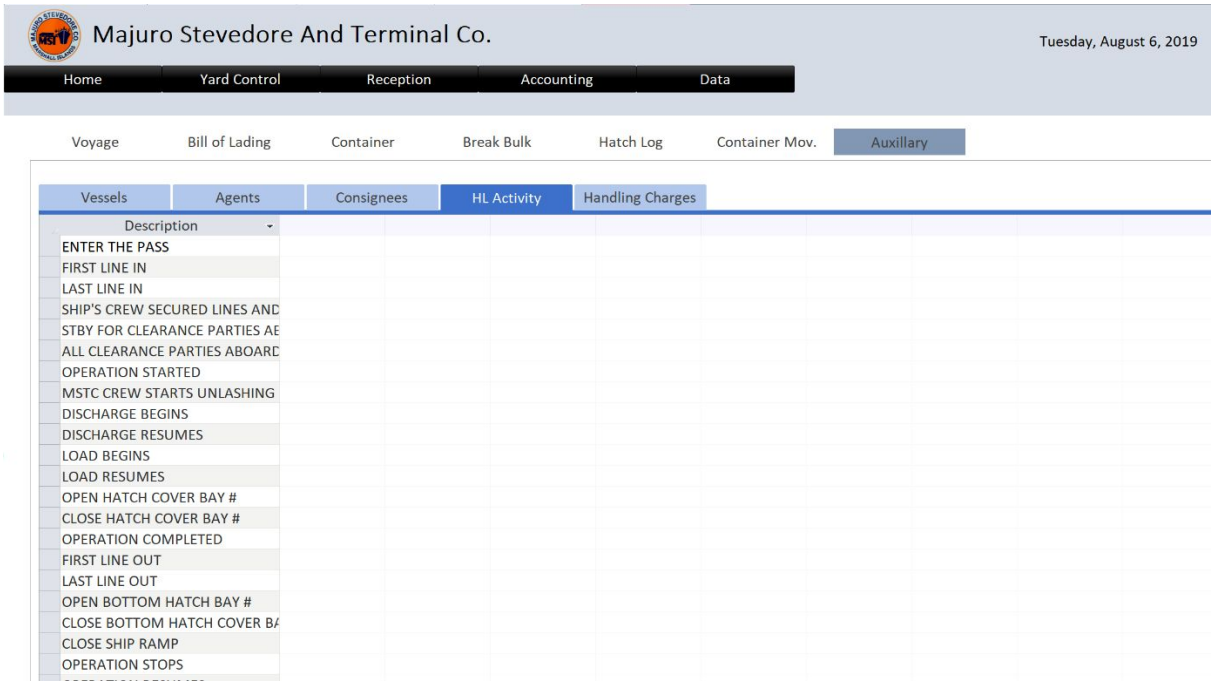
Container No	Type	Arrival Date	Agent	First Move	FDir	FState	Vehicle	Last Move	LDir	LState	LRemarks	B/L No	Consignee
DRYU2944070	20DC	8/5/2019	RRE	8/6/2019	Out	Full	MST	8/6/2019	Out	Full		GUM-033316	Easy Life
DFSU3064445	20DY	7/16/2019	RRE	8/5/2019	In	Empty	MST	8/5/2019	In	Empty			
CAXU8029977	40D	7/30/2019	RRE	8/1/2019	Out	Full	MST/ FRM	8/1/2019	Out	Full		KRPUS613383	Formosa Shopping Center
SEGU9046640	40RH	7/16/2019	RRE	8/1/2019	Out	Empty	U/I / TRUC	8/1/2019	Out	Empty	PPF		
JSSU1661838	20FT	7/30/2019	RRE	8/1/2019	Out	Full	MST	8/1/2019	Out	Full		IDJKT0610240	AAA Company
CRXU7690328	40F	7/29/2019	PSI	8/1/2019	Out	Full	CYD UNST	8/1/2019	Out	Full		XMN19009718	Marshall Islands Fishing
PCIU1510797	20D	7/29/2019	PSI	8/1/2019	Out	Full	MST / SID	8/1/2019	Out	Full		KHH19028707	Marshall Islands Fishing
AMFU8830862	40HC	7/29/2019	PSI	7/31/2019	Out	Full	MST	7/31/2019	Out	Full		HUA19038190	Z-BROTHER
TCKU3567895	20D	7/30/2019	RRE	7/31/2019	Out	Full	MST	7/31/2019	Out	Full			
CRSU1024940	20D	7/30/2019	RRE	7/31/2019	Out	Full	MST	7/31/2019	Out	Full		IDJKT0610059	Z-BROTHER
FCIU3390875	20D	7/30/2019	RRE	7/31/2019	Out	Full	MST	7/31/2019	Out	Full		MYPKG0611694	Z-BROTHER
FCIU8438605	40D	7/30/2019	RRE	7/31/2019	Out	Full	U/I TRUCK	7/31/2019	Out	Full		USLGB0610648	EZ Price Mart
MATU5130677	40R	7/19/2019	MATSON NAVIGATION	7/31/2019	In	Empty	MST	7/31/2019	In	Empty	KAMOKUIKI V-0		
TCKU2616660	20D	7/30/2019	RRE	7/31/2019	Out	Full	MST	7/31/2019	Out	Full		TWKHH061228	Home Garden

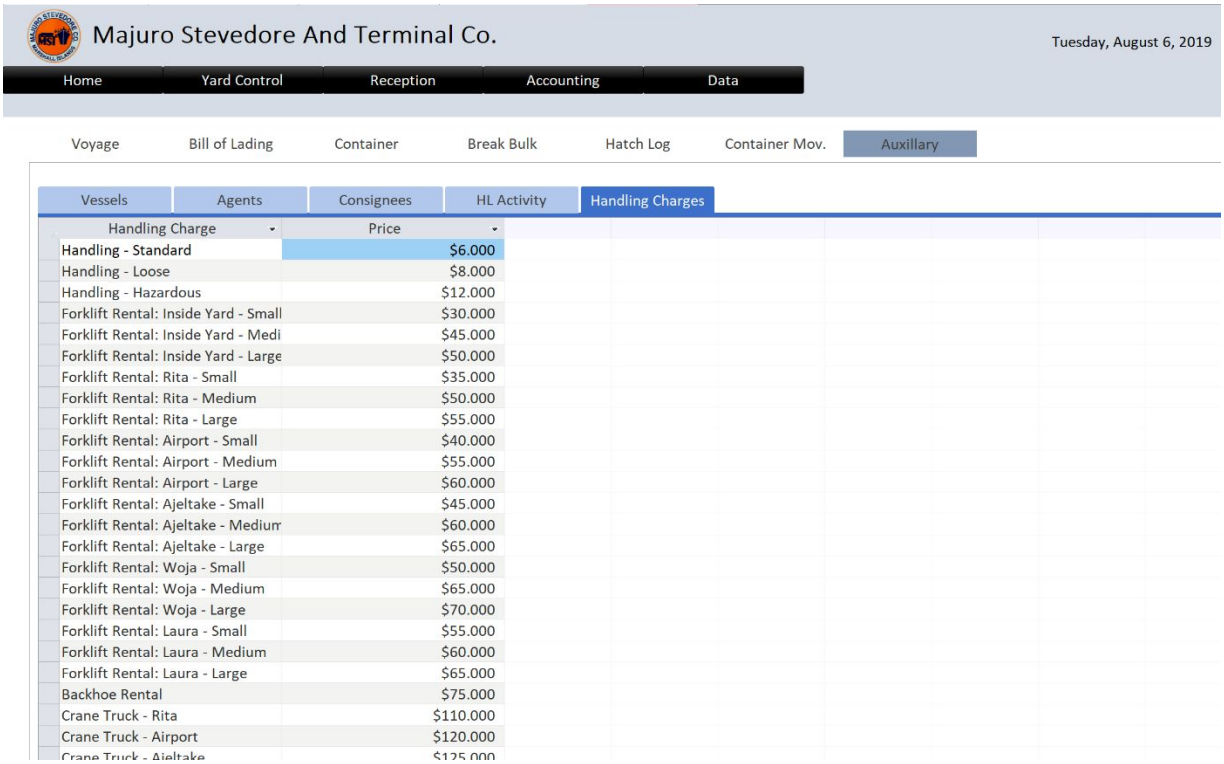
2. The *Auxiliary* tab presents some miscellaneous data like lists of vessels and agents. It allows the user to add items to the list, and to edit and delete existing items.




Majuro Stevedore And Terminal Co.
Tuesday, August 6, 2019
Home
Yard Control
Reception
Accounting
Data
Voyage
Bill of Lading
Container
Break Bulk
Hatch Log
Container Mov.
Auxillary
Vessels
Agents
Consignees
HL Activity
Handling Charges
Agent_Name
Central Pacific Maritime Agency
Mariana Express Lines Pte Ltd
MATSON NAVIGATION
PSI
RRE
Unknown

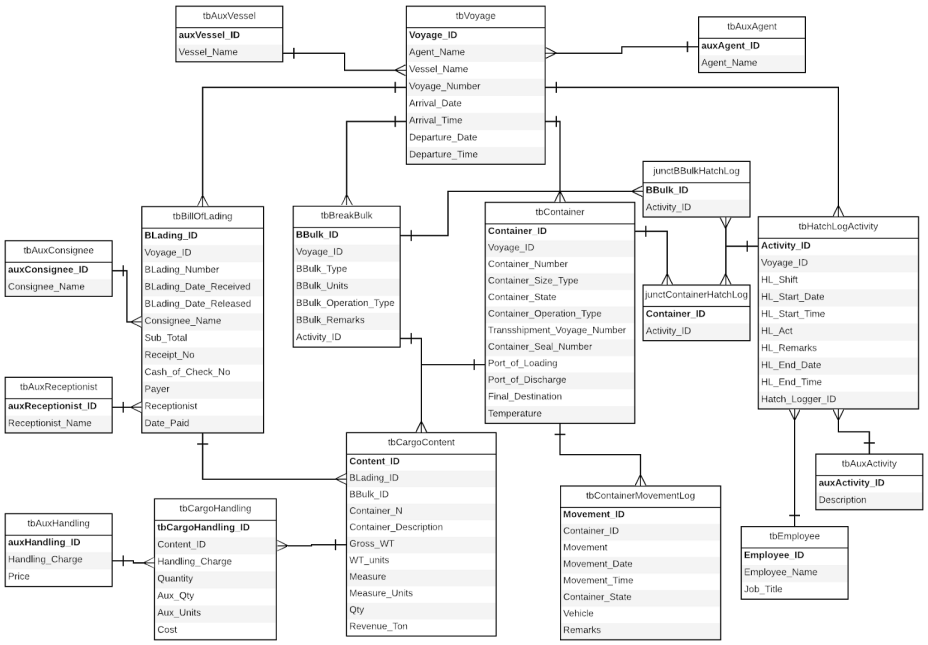

Majuro Stevedore And Terminal Co.
Tuesday, August 6, 2019
Home
Yard Control
Reception
Accounting
Data
Voyage
Bill of Lading
Container
Break Bulk
Hatch Log
Container Mov.
Auxillary
Vessels
Agents
Consignees
HL Activity
Handling Charges
Consignee Name
AAA Company
Air Marshall Islands
Central Pacific Maritime
DAR Shipping Agency
DMC Enterprises
Dream Company
Easy Life
ELM Motors
EZ Price Mart
Family Mart
FAR PACIFIC HOLDING CO. LTD
Fen Yu Xin, One Dollar Store
Formosa Shopping Center
FSM PETRO CORP
GREEN ENERGY SOLUTIONS, INC
Home Garden
ISLAND ECO
J & H GROUP
J & M Enterprise
Jane's Corporation
Jeramon Hardware


Majuro Stevedore And Terminal Co.
Tuesday, August 6, 2019
Home
Yard Control
Reception
Accounting
Data
Voyage
Bill of Lading
Container
Break Bulk
Hatch Log
Container Mov.
Auxillary
Vessels
Agents
Consignees
HL Activity
Handling Charges
Description
ENTER THE PASS
FIRST LINE IN
LAST LINE IN
SHIP'S CREW SECURED LINES AND
STBY FOR CLEARANCE PARTIES AE
ALL CLEARANCE PARTIES ABOARD
OPERATION STARTED
MSTC CREW STARTS UNLASHING
DISCHARGE BEGINS
DISCHARGE RESUMES
LOAD BEGINS
LOAD RESUMES
OPEN HATCH COVER BAY #
CLOSE HATCH COVER BAY #
OPERATION COMPLETED
FIRST LINE OUT
LAST LINE OUT
OPEN BOTTOM HATCH BAY #
CLOSE BOTTOM HATCH COVER BA
CLOSE SHIP RAMP
OPERATION STOPS

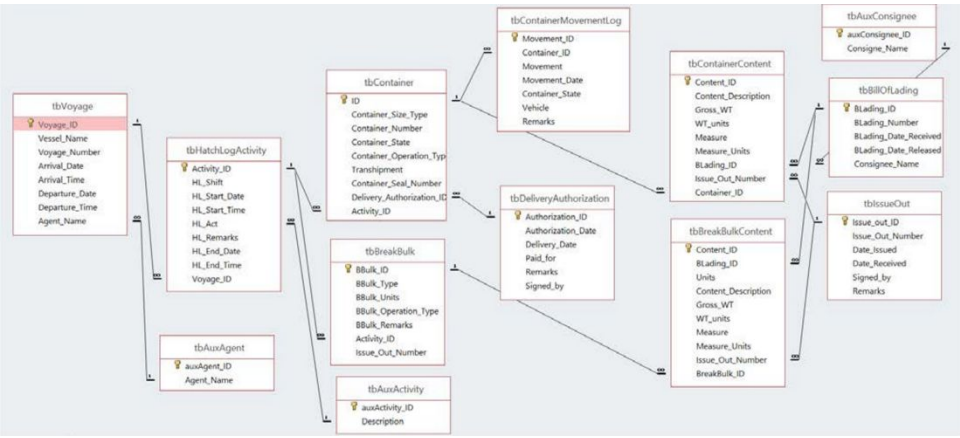

Majuro Stevedore And Terminal Co.
Tuesday, August 6, 2019
Home
Yard Control
Reception
Accounting
Data
Voyage
Bill of Lading
Container
Break Bulk
Hatch Log
Container Mov.
Auxillary
Vessels
Agents
Consignees
HL Activity
Handling Charges
Handling Charge
Price
Handling - Standard $6.000
Handling - Loose $8.000
Handling - Hazardous $12.000
Forklift Rental: Inside Yard - Small $30.000
Forklift Rental: Inside Yard - Medi $45.000
Forklift Rental: Inside Yard - Large $50.000
Forklift Rental: Rita - Small $35.000
Forklift Rental: Rita - Medium $50.000
Forklift Rental: Rita - Large $55.000
Forklift Rental: Airport - Small $40.000
Forklift Rental: Airport - Medium $55.000
Forklift Rental: Airport - Large $60.000
Forklift Rental: Ajeltake - Small $45.000
Forklift Rental: Ajeltake - Medium $60.000
Forklift Rental: Ajeltake - Large $65.000
Forklift Rental: Woja - Small $50.000
Forklift Rental: Woja - Medium $65.000
Forklift Rental: Woja - Large $70.000
Forklift Rental: Laura - Small $55.000
Forklift Rental: Laura - Medium $60.000
Forklift Rental: Laura - Large $65.000
Backhoe Rental $75.000
Crane Truck - Rita $110.000
Crane Truck - Airport $120.000
Crane Truck - Ajeltake $125.000

Appendix B: Updated Database ERD and Previous Engagement ERD

Updated Database ERD



Old Database ERD



Appendix C: