Fall17 CS6400: Tools-4-Rent!

Overview:

A hypothetical national chain of tool rental stores, "*Tools-4-Rent!*", has decided to try out a new online tools rental service for its Customers. They've already done an informal survey of their regular rental Customers and determined that the majority of them would be interested in online inventory and reservation services. At the same time, *Tools-4-Rent!* has decided to upgrade their entire paper record based tools rental service to improve efficiency in tracking a larger inventory. Your job is to develop the information management system that supports some of the services involved in the tools rental service. *Tools-4-Rent!* has decided that each store will have its own isolated instance of the online application.

Tool Categories:

The *Tools-4-Rent!* service will have **4 categories of tools** available for rental: **Hand Tools, Garden Tools, Ladders**, and **Power Tools**. **Hand tools** include items such as wrenches, sockets, screwdrivers, hammers, etc. **Garden tools** include digging tools, pruning tools, trimmers, rakes, wheelbarrows, and striking tools. **Ladders** include straight and step. **Power Tools** include drills, saws, sanders, mixers, etc. **Tools** are also divided into **4 separate sub-types** based on **power source**: 110-240 Volt ***A/C* electric** (corded), 7.2-80.0 Volt **D/C *battery*** powered (cordless), ***gas*-powered**, and ***manual*** (no motor). Each tool type is further specialized into **sub-sub-types**. A full list of tool category/sub-types teams are required to use for this project is shown in **Appendix 1**.

Project design assumptions:

Garden Tools may run on any power-source: manual, gas, electric, or cordless. All Ladders, all Hand Tools are considered 'manual-powered'. Note: some tools will have multiple power-source types depending on the tool. Teams will probably wondering about the difference between a "Power Tool" and a "Garden Tool" considering they both can be run on artificial power sources. For this project we will assume any tool related to **outside for landscaping work** is a **"Garden" Tool**. Whereas any artificially powered tool which is presumably used **indoors for construction** will be considered a "**Power" Tool**.

An example tool hierarchy is shown below with multiple sub-types:

Gardening Tool: (category) + **Manual**: (power-source type)

- **Digging Tool** (sub-type) — UI header short-description = "**Scoop Shovel**"
  - **Scoop Shovel**: (sub-sub-type)
    - full-description: "[dimensions]+[sub-sub-type]+[sub-type]+ […other descriptors…]+[manufacturer]"

Power Tool: (category) + **Cordless**: (power-source type)

- **Drill** (sub-type) — UI header short-description = "**Cordless Hammer Drill**"
  - **Hammer**: (sub-sub-type)
    - full-description: [dimensions]+ [power-src]+[sub-sub-type]+[sub-type]+[*-ratings]+[manufacturer]"

Power Tool Accessories:

Tool accessories are unique to power tools and must be listed separately (e.g. drill bits, hose, gas tank, hard case, safety wear, etc.) and each tool may have more than one accessory. All accessories include an accessory name and accessory quantity (whole-number). For D/C cordless power tools, batteries are considered accessories with the following specifications: voltage, amperage, and quantity. All accessories must be paired at the time of rental and/or sale with their applicable power tool.

Tool Full Description:

To obtain further information about the tool, the rental Customer may enter a unique **tool number**, and click on a link or select "**View Details**", to get a **full-description of a tool** is described by several attributes depending on tool type: "Description" for all UI table headers is a short-description based on an aggregate of data derived from: [power-source]+[short-detail]+[short-desc], if a tool runs manually, the power-source information is excluded in the short description. Items with an **asterisk '*' are required to contain values** for those attributes in every instance of that tool.

All Tools:

- ***sub-type** [string]**:** (e.g. 'screwdriver', 'digging', 'rake', 'socket', 'hammer') ***(Required for all tools)***
- ***sub-sub-type (specialized)** [string]**:** (e.g. 'phillips', 'hex, 'circular', 'hack saw) ***(Required for all tools)***
- ***width/diameter** [number]**:** e.g. '2', '8-1/2', '13', '22-1/8' assumes "inch" unit ***(Required for all tools)***
- ***length** [number]**:** e.g. '6', '8-3/8', '13', '22-3/4', '24' assumes "inch" unit ***(Required for all tools)***
- ***manufacturer** [string]**:** (e.g. 'DEWALT', 'Milwaukee', 'Ryobi', etc.) ***(Required for all tools)***
- **material [**string]**:** (e.g. 'aluminum', 'fiberglass', 'steel', 'iron', etc.)

*Only **Power** Tools: (All units below assume USC units: inches, watts, psi, RPM, volt, amp, etc.)*

- ***power-source** [list of strings]**:** either 'electric' (A/C) *OR* 'cordless' (D/C) *OR* 'gas' ***(Required)***
- ***volt-rating** [number]**:** either: 110V, 120V, 220V, or 240V assumes "Volt" unit ***(Required for all Power Tools)***
- ***amp-rating** [number]**:** e.g. 1.0, 5.0, 30 assumes "Amp" unit ***(Required for all Power Tools)***
- **power-rating** [number]**:** e.g. 18.0, 30, 88, 10000 assumes "Watts" unit
- **pressure-rating** [number]**:** e.g. 300.0, 25000 assumes "psi" unit
- **gauge-rating** [whole-number]**:** either 18, 20, 22, or 24G assumes "gauge" unit
- **capacity** whole-number]**:** e.g. 20, 100, 1000 - number of nails/staples
- **torque-rating** [number]**:** e.g. 80.0, 3500 assumes "ft-lb" unit (variable torque: min/max, single torque: just min)
- ***rpm-rating** [number]**:** e.g. 2000, 3500 (variable speed: min/max, single speed: just min **RPM**) ***(Required for all Power Tools)***

*Only Power Tool **Accessories**:*

- ***accessory-description** [string]: (e.g. 'battery', 'safety goggles', 'gas tank', etc.) ***(Required for accessories)***
- ***accessory-quantity** [whole-number]: (e.g. '1' vs. '3') ***(Required for accessories)***

*Only **Cordless** Power Tools*:

- ***battery-type** [list of strings]**:** either 'Li-Ion' *OR* 'NiCd' *OR* 'NiMH' *(abbreviations only)* ***(Required for all cordless tools)***

*All **Garden** Tools*:

- ***handle-material** [string]**:** (e.g. 'wooden', 'fiberglass', 'poly', 'metal', etc.) ***(Required for all garden tools)***

*Only **Pruning** Tools*:

- **blade-material** [string]**:** (e.g. 'steel', 'titanium', etc.)
- ***blade-length** [number]**:** (e.g. '24' in, '5-1/8' in.) assumes "inch" unit ***(Required for all pruning tools)***

*Only **Striking** Tools*:

- ***head-weight** [number]**:** (e.g. '3.5' lb., '8.9' lb. axe head weight) assume "pound" unit ***(Required for all striking tools)***

*Only **Digging** Tools*:

- **blade-width** [number]**:** (e.g. '9-3/4' in, '6-7/8' in) assumes "inch" unit
- ***blade-length** [number]**:** (e.g. '6-1/2' in, '10-1/8' in) ***(Required for all striking tools)***

*Only **Rake Tools*** (digging):

- ***tine-count** [whole-number]**:** (e.g. '14' vs '16' tine) ***(Required for all rake tools)***

*Only **Wheelbarrow** Tools*:

- ***bin-material** [string]**:** (e.g. 'steel', 'fiberglass', 'poly', etc.) ***(Required for all wheelbarrows)***
- **bin-volume [**number]**:** (e.g. '5.9' cu ft., '10.2' cu ft.) assumes "cubic feet" unit
- ***wheel-count** [whole-number] (e.g. 1 vs. 2 wheeled) ***(Required for all wheelbarrows)***

Note: some number units may be stored as float converted to whole-number (dropping the dot zero '.0') if needed.

To clarify: for any **tool-category** ('hand', 'garden', 'power', or 'ladder') must have a **power-source type** (e.g. 'corded', 'cordless', 'gas', or 'manual') and **sub-type**: (e.g. 'straight' vs. 'trimmer' vs. 'socket' vs. 'hammer' vs. 'screwdrivers' vs. 'sanders') for which the optional **sub-sub-types** further subdivide (e.g. 'rigid, 'folding, 'hedge', 'string', 'deep', 'impact', 'claw', 'framing', 'phillips','belt', 'sheet', etc.).

Therefore, the full-description includes all information known about the tool, *excluding* reservations and sale or service orders.
Example **format**: system + dimensions +power-source + sub-type + *less specialized* sub-type + [… other information…] + manufacturer

- "1/2 in. W x 2 in. L 3/8 in. drive Torque Wrench by Husky"
  *Hand full-desc = "[dimensions]+[sub-sub-type]+[sub-type]+[manufacturer]"

- "10-1/2 in. W x 12 in. L Cordless Hammer Drill 36 Volt 5.0 Amp 1600 RPM by DEWALT"
  - Accessory1: " (2) 36 Volt 5.0 Amp Li-Ion batteries"
  - Accessory2: "(1) contractor bag"

  power-full-desc = "[dimensions]+ [power-src]+[sub-sub-type]+[sub-type]+[-ratings]+[manufacturer]"
  *acc-full-desc1: [acc-quantity]+[volt-rating]+[amp-rating]+[battery-type]+[acc-desc]

*For the purposes of the demo, a tool's full-description, while stored in the database as separate attributes, will be combined into a single concatenated string in the UI output as shown in **Figure-6**. Teams may need to add sematic chars '()' or 'W' 'x' or 'L' as needed.

Keep in mind, the full-description string should represent all applicable attributes for each specialized sub-type when present.
If teams change the order of amps first then voltage or other that is fine as well, just ensure if a value is stored in the DB for all attributes for a specific tool, the 'full-description' should show all of them. Just please show dimensions first and manufacturer last.

Users:

The *Tools-4-Rent!* service will have 2 types of user roles, the **Rental Customers** and **Clerks** on duty. A **User** contains **username**, **full name** (first, middle, last), **email** , and **password** (optional hash storage). A **Customer** is any user interested in *renting* a tool. The **Clerk** on duty represents the employee responsible for handling the tool inventory. In the rest of this document, we first describe the user interface (UI) for each user role, then present aspects of the system as a whole. We will assume throughout the document that all users will access the system through the same entry point on the Login page (**Figure-1**).

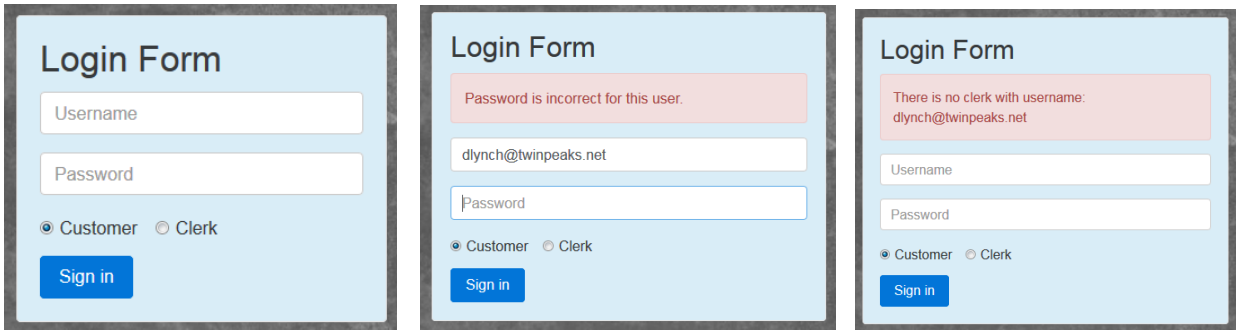


Figure 1 - Login screen for all users (with error messages)

Customers:

The main menu is different depending on user role (Clerk vs. Customer). If the current user is a **Customer**, they login by entering a username and password, selecting the "**Customer**" **radio button** on the login form, and clicks the "Sign-in/login" button. If no Customer exists in the system with that username, then a new registration interface (**Figure-3**) will pop up prompting the user to create a new profile by registering prior to accessing the system. If the Customer tries to login as a Clerk, an error message should also be displayed.

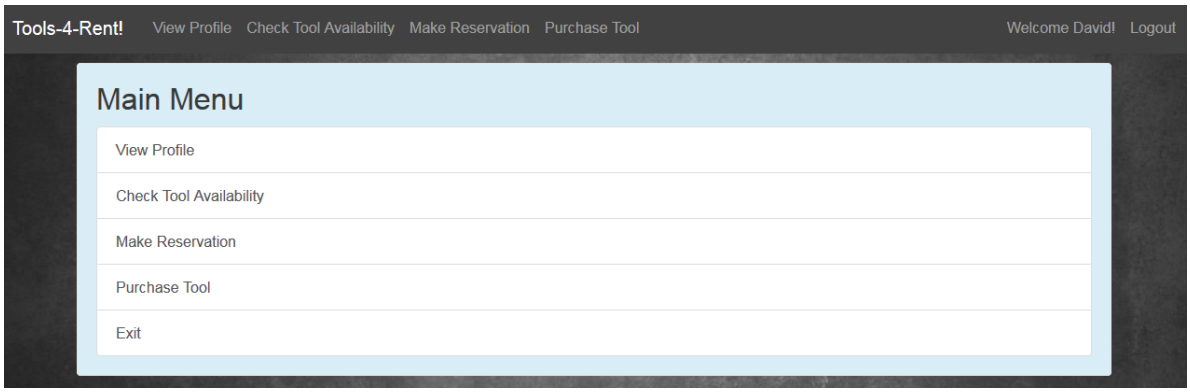


Figure 2 – Customer Main Menu

Registration: (Customer role only)

The registration form (UI) must include the following separate input fields: username, email address, full name (first, middle, last), home phone, work phone, and cell phone. Phone numbers should also account for hyphens '-', non-international area codes with optional extensions (e.g. '404-894-2000x1234'). Every Customer is required to have exactly one '**primary'** phone number (may be either home, work, or cell). Customers are required to select the primary phone prior to finishing the registration process. Any Customer may have more than one phone number: home, work, or cell. Note: **phone numbers** should contain separate fields: area code, phone number, extension.

For this project, Customers are allowed to have only one single **Address** (e.g. 801 Atlantic Drive NW, Atlanta, GA 30332-2014) should contain separate fields: street, city, state, *9-digit* zip code plus the hyphen '-'. If a valid **Customer** exists with that username, regardless of if password entered was correct, the user should not be allowed to register as a new customer (**Figure-3**).

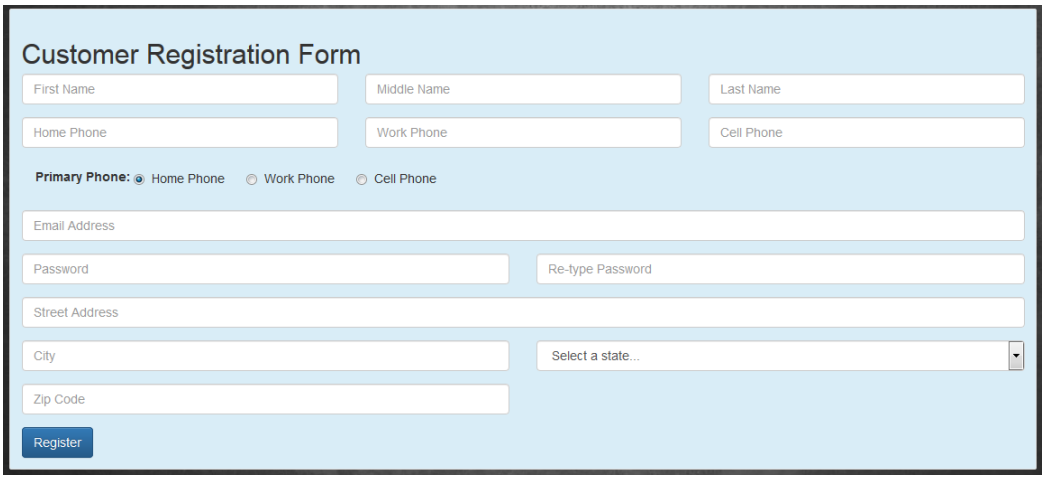


Figure 3 – Register (Customers only)

View Profile: (Customer role)

When a rental Customer selects the "**View Profile**" task from the main menu, the view profile page (**Figure-4**) is loaded into the browser. The profile lists all of the known information about the user, including profile information, and rental history. The **rental history** lists the summaries for all reservations made by the user, ordered from **most recent to oldest**, and includes the **names of Clerk** who handled the each part of the reservation (pick-up/drop-off). Note: Figure-4 shows two tools in single reservation (no priors) and the reservation as yet to be picked up or dropped off (so clerk entries are blank).

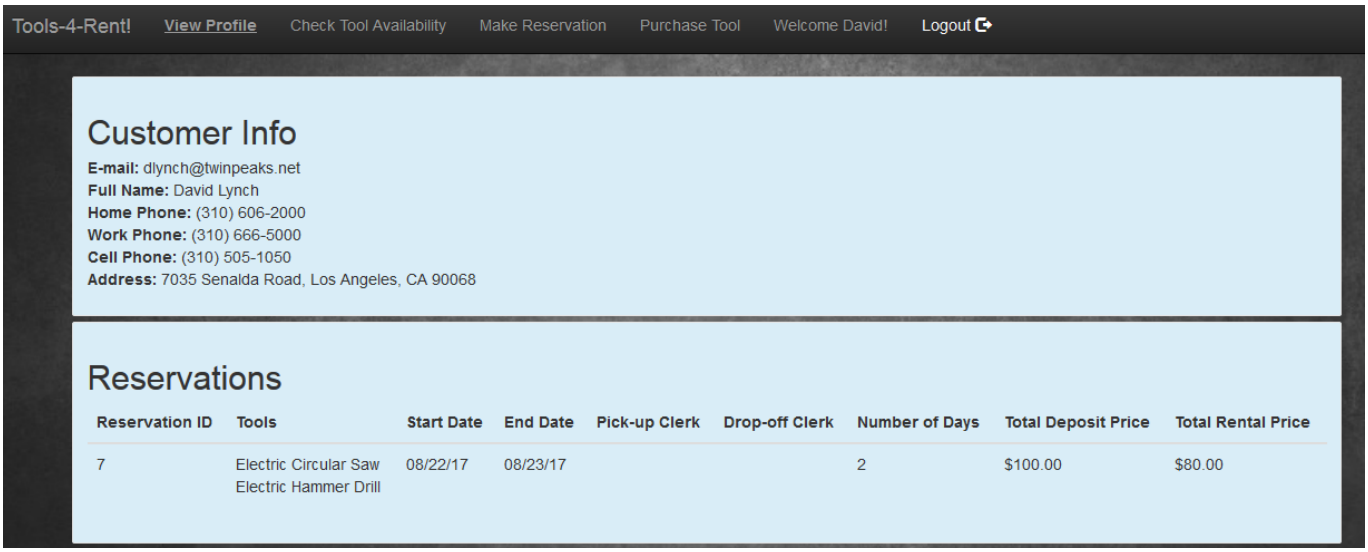


Figure 4 – View Profile as rental Customer

Check Tool Availability: (Customer role)

The final option available to the rental Customer is to check the inventory of the store available over a specific time period. When the "**Check Tool Availability**" option is selected from the main menu, a page is loaded (Error! Reference source not found.**5**) where the user can select the type of tool they are interested in checking on, and set the dates of their query. Customers will have the option to customize a search for a given tool by using any combination of start/end dates, tool category, power-source/sub-types, and/or **keyword search**. If more than 10 tools are returned in the list, the UI should prompt the user the specify a more unique search (by entering more criteria). After pressing the search button, the rental Customer is presented with the inventory available during their specified time frame and search criteria, displaying unique **tool number**, a **short-description** (aggregate), **deposit** price/day required ($0.00), and **rental price/day** in currency units ($0.00).

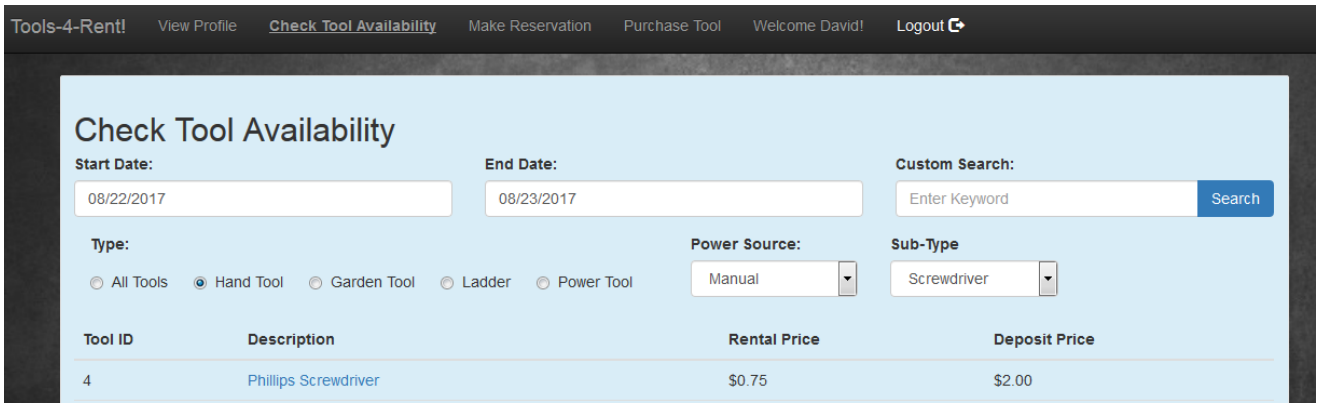


Figure 5 – Check Tool Availability

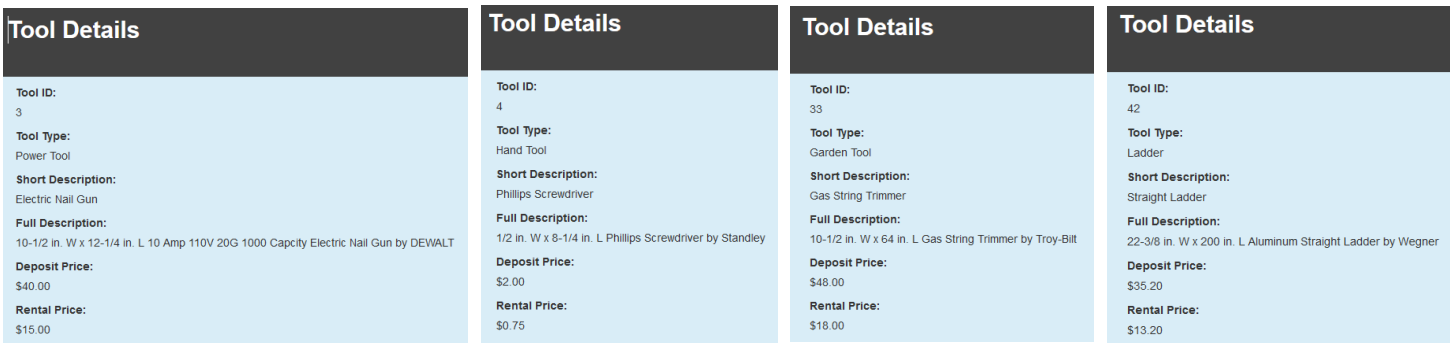


Figure 6 – Check Tool Availability – Tool Details examples

If the Customer wishes to see further **details** on a specific tool, they click on a link to show a **full-description** (see section above). Again, for the purposes of the demo, a tool's full-description, while stored in the database as separate attributes, will be combined into a single concatenated string in the UI output (**Figure-6**). The available inventory includes all tools that will be available for rent on every day from start date to end date. Implementation considerations: all columns should be **sortable** (ascending/descending) by any field/header (ID, description, deposit price, rental price, etc.) Tools which are either 'in-repair' or 'for-sale/sold' should not show on the available list since sale/service records exists for the same dates. Any tool (where only 1 exists in entire inventory) with an existing reservation should not be listed in available tools for the same day. We recommend teams test for these cases during implementation.

Make Reservation: (Customer role)

When the "**Make Reservation**" button is selected from main menu, a new interface is loaded (**Figure**). The Customer enters a **start and end date** for the reservation, and selects a **tool type**. The rows displayed will depend on search criteria entered by the user and the inventory available for rent. Customers are able to search by any combination of start/end dates, tool category, power-source/sub-types (dropdowns), and/or **keyword search**. For each tool, the system presents the unique tool number, short-description, rental price, deposit price for one day's rental.

Note: 'one day' is defined as a 24 hour increment: **12:00:00 AM-11:59:59 PM** for any given date. All tools are only available for daily rental (no hourly option). Daily **rental prices** are **15%** of the original purchase price rounded *up* to nearest cent. **Deposit prices** are **40%** of the original purchase price rounded *up* to nearest cent. **Sale prices** are **50%** of the original purchase price rounded *up* to nearest cent. **Purchase price** is ***required*** when the Clerk uses the "Add-Tool" interface (or with the DBA re-creates the default database state prior to the demo), while the other prices are *derived* based on this original purchase price (not stored). The only price which is can be anything is '**repair-cost'** which the Clerk determines at the time of placing a service request.

A customer must rent **less than ten tools per reservation**. Once the 11th tool is requested, an error message should be displayed prompting the user to reduce the number of tools in the current reservation to 10. Customers are free to add/remove tools as needed to fulfill their reservation request. Once a specific tool available inventory reaches zero, e.g. (1) 18.0V cordless drill available in the inventory, Customer requests (2), an error message should be displayed to Customer. If an identical tool requested is **due to return within the next 24 hours** from the time of the request, a notice is given to the user telling them the date/time when that tool is expected to become available so they can decide if they want to rent it later or make an alternate selection.

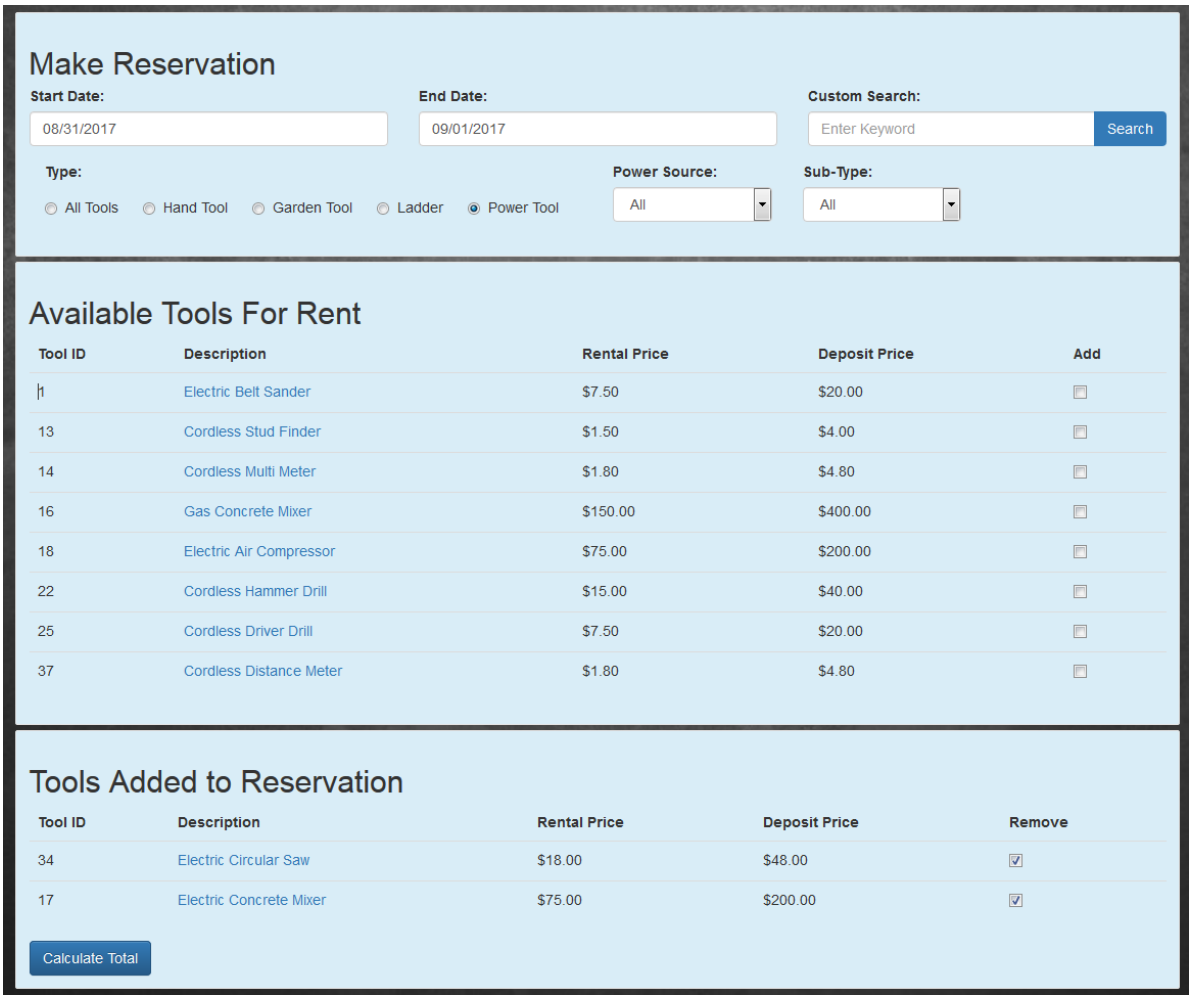


Figure 7 - Make reservation screen

When the "**Calculate Total**" button is pressed, a **summary of the reservation** (**Figure-8**) is displayed before being entered into the system. The total rental price and the **total deposit price**, which will be refunded upon returning the tools, is displayed for all tools. The rental price is calculated as the **sum of the rental prices** for all tools rented, multiplied by the **number of days** over which they are rented. The **total deposit** price is the sum of the deposits required for each individual tool. Both totals: rental and deposit should be itemized separately as shown.

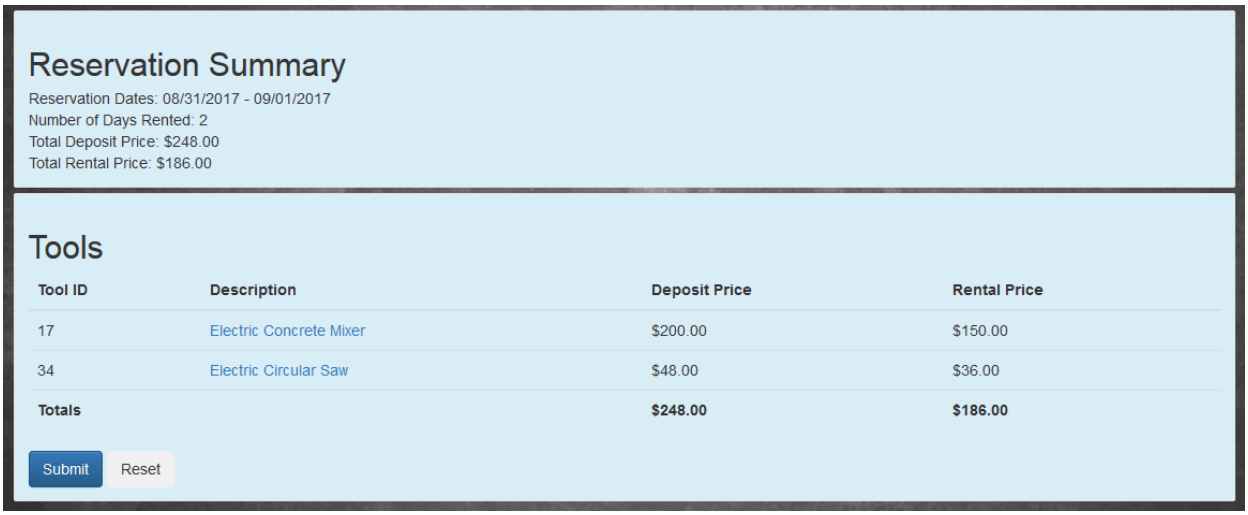


Figure 8 - Reservation Summary and confirmation number

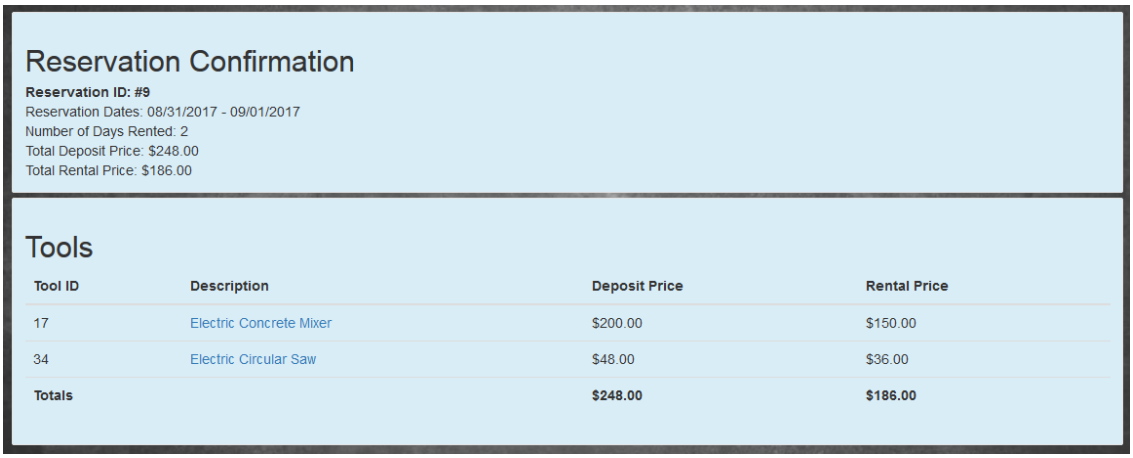


Figure 9 - Reservation Confirmation Number

When the "**Submit**" button on **Error! Reference source not found.**8 is pressed, a final reservation screen (**Figure-9**) should pop up if the reservation is successful, displaying the unique **confirmation number** in addition to the **reservation summary with totals**. No reservation should be successful if any of the tools being reserved are already reserved over the same time period. When the "**Reset**" button on Figure-8 is pressed, it means the Customer changed their mind and that record is either deleted from the database or not committed in the first place (team's choice on implementation). ***Concurrency consideration***: assume if CustomerA has a specific tool in the pending reservation status (where only one of that tool is available in the system), if CustomerB selects the same tool for the same day and hits "Submit" before the CustomerA, CustomerB is given the tool and a notice of unavailability of the specific tool is displayed to CustomerA prompting them to make another selection. (Pending tool reservations do not guarantee availability until they are confirmed.)

Purchase Tool (complete Sale Order in Customer role):

When the "**Purchase Tool**" button is selected from main menu, a new interface is loaded (**Figure-10**). Customer selects from list of tools marked 'for-sale' by the system. The purchase tool task is the similar to the "Make Reservation". The only difference is a single date input to check for tools in the future. Customers are able to search by any combination of purchase date, tool category, power-source/sub-types, and/or **keyword search.** Customer selects **tools** from list, clicks "submit", then is shown the *sale* confirmation. If a credit card is not on file for the Customer wanting to purchase a tool, the Customer is prompted to enter this credit card information before being allowed to proceed with the sale.

Note: when a Clerk marks a tool 'for-sale', a new 'Sale Order' instance is created with a 'for-sale date' entered at that time. However the Customer and 'sold-date' was not yet determined. When the Customer decides to purchase, the Customer and 'sold-date' is inserted for that Sale Order instance previously created by the Clerk in the "Sell Tool" interface.

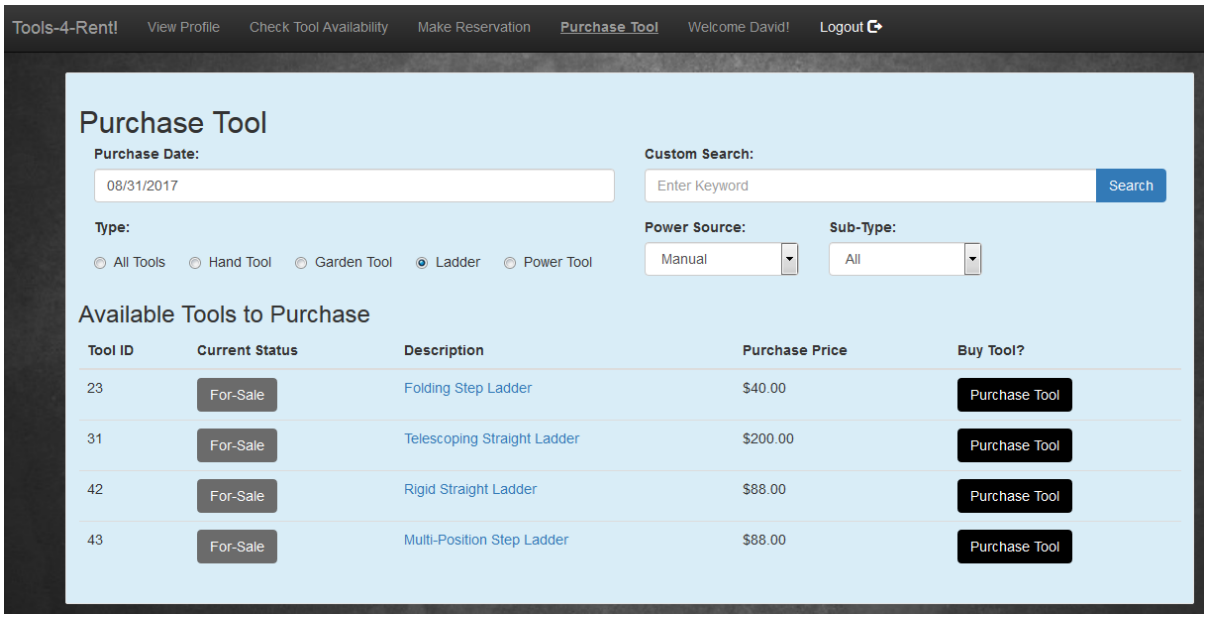


Figure 10 – Purchase Tool

Clerks:

The main menu interface is different depending on user role (Clerk vs. Customer). The Clerk at *Tools-4-Rent!* will login to the system through the login interface (**Figure-1**) clicking the "**Clerk**" radio button and entering the correct username and password. When the Clerk is hired, their username, email, temporary password, employee number, and date-of-hire are entered into the system by the System Administrator. Both the **employee number** and **date-of-hire** are tracked for each Clerk. If the Clerk tries to login as a Customer or with the incorrect password, error messages should be displayed. If this is the first time the clerk has logged in using a temporary password, then the Clerk is prompted to enter a new password twice. When a successful login is completed, the Clerk is presented with a their version of the main-menu interface (Figure-11). All email addresses for Clerks contain the **domain name**: '*@tools4rent.com*'

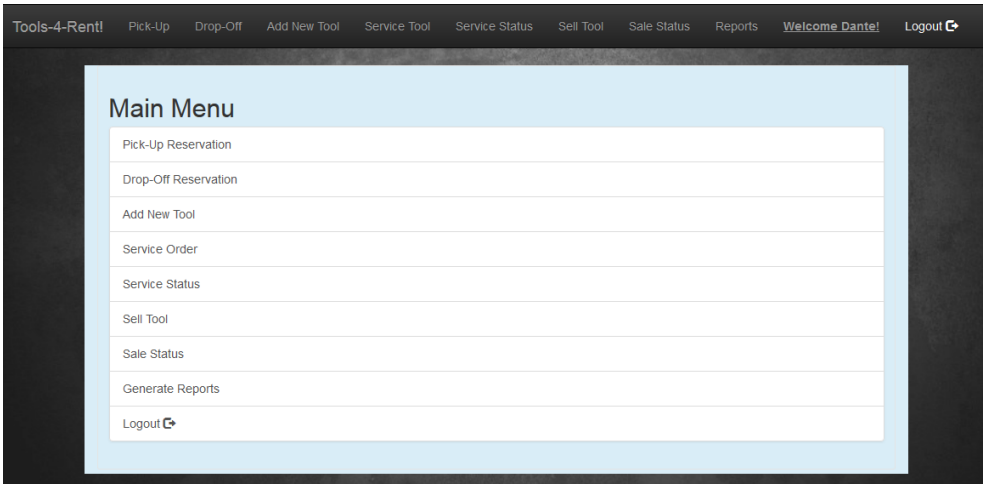
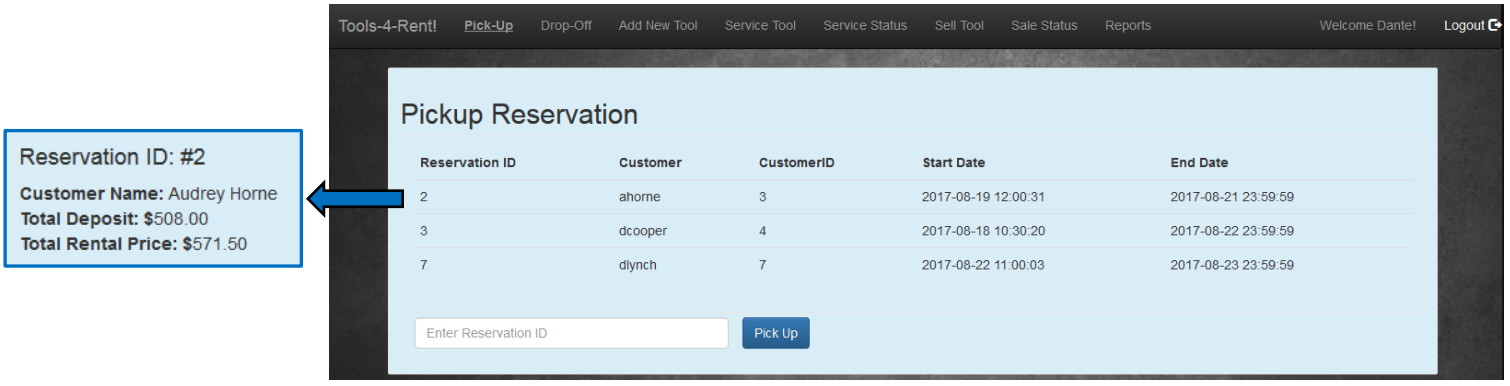
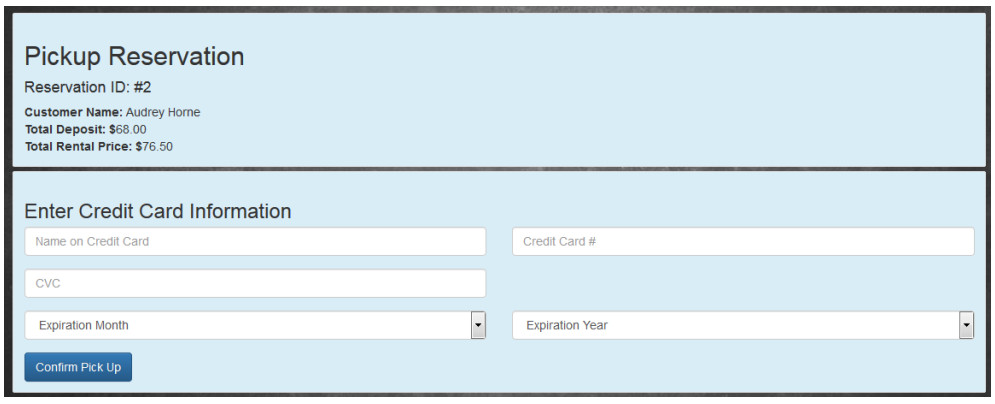


Figure 11 - Clerk Main Menu

Pick-Up Reservation: (Clerk role)

The Clerk's primary task is to handle the **pick-up** and **drop-off** of tools that Customers have reserved. When the Pick-up Reservation form is loaded, it will automatically show all reservations which are waiting to be picked up. From this list the Clerk can either enter the specific reservation number or clicks a link to view more details about the selected reservation. After the desired **reservation number** (*unique ID*) is entered and the "Pick-Up" button is pressed, a summary of the reservation is displayed (**Figure-12**).





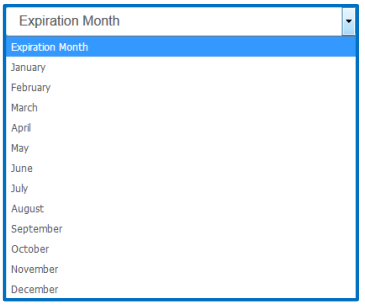


Figure 12 - Pick-up Reservation (with drop-down expiration month)

If the credit card information does not exist in the Customer's profile, the Clerk is prompted to enter the **Customer's credit card** number, name on card, expiration month as a dropdown menu, expiration year as a dropdown menu, CVC 3-digit number (on back), and selects the "**Confirm Pick-Up**" button. This loads the rental contract with summary for the transaction (**Figure-13**).

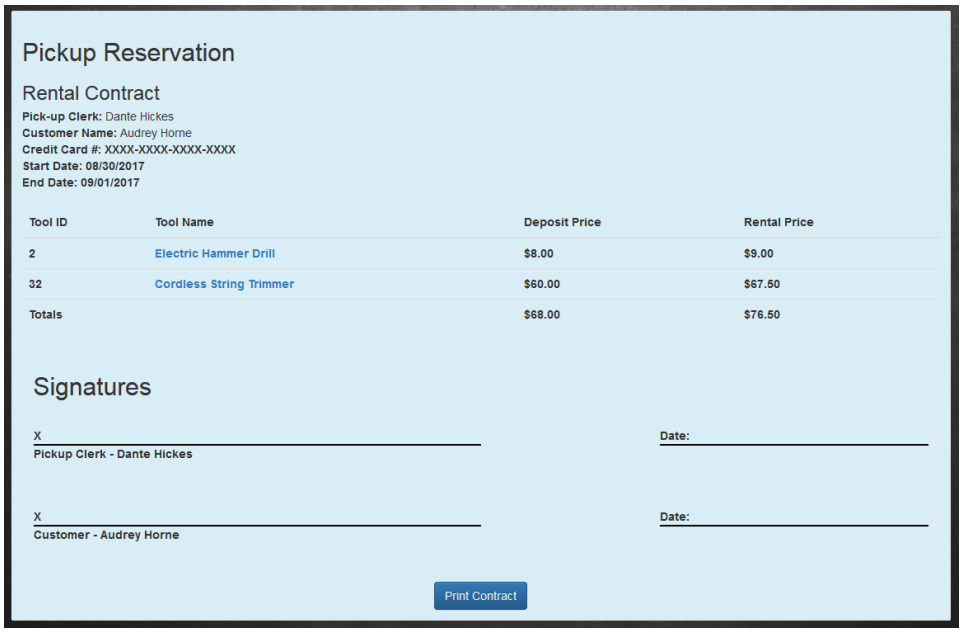
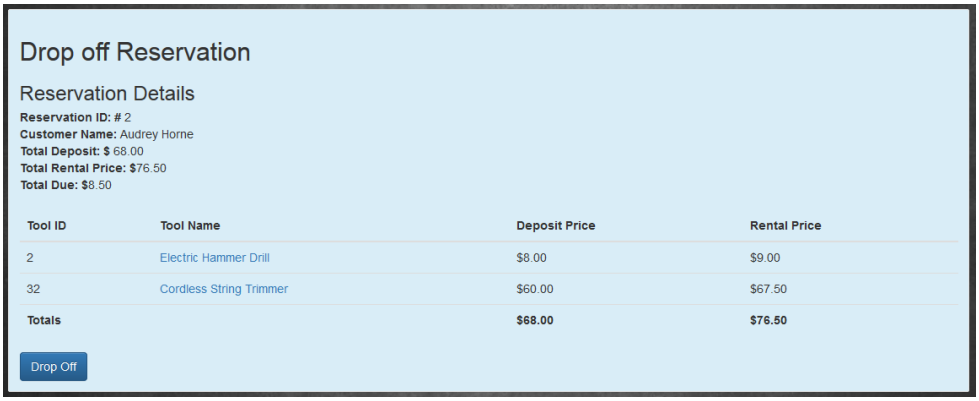


Figure 13 - Rental contract after pick-up (printable)

Drop-Off Reservation: (Clerk role)

The **drop-off** task is essentially the same as pick-up, without requiring a credit card number and expiration date to be re-entered. The credit card charged is the same credit card used for the deposit for all rentals. At the end of the task, the **final receipt** (**Figure-14**) is automatically loaded into the browser (alert/pop-up) which the user can optionally print for their records.



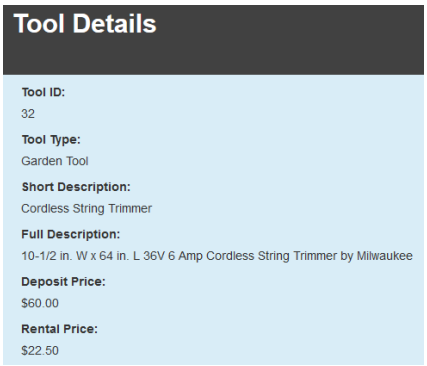


Figure 14 - Drop-off Reservation (with Tool Details)

Add Tool: (Clerk role)

The Clerks are also responsible for **adding new tools to the inventory**. Every tool inserted should have an abbreviated description, an original **purchase price**, **rental price** of 25% of purchase price (per day), a **deposit amount** of 40% of purchase price (per reservation), and a detailed information applicable to the specific tool. The **deposit and rental prices** are automatically filled for the Clerk based on the purchase price entered. In addition, it has been requested that **accessories** be separately listed for power tools, because power tools often include small and easily displaced parts that are expensive to replace. This will assist Clerks in making sure the tools are complete when they are returned to the store. When batteries are added to a cordless power tool, the tool's power requirement is based on the battery information entered to the system as accessories. In other words, when an 18.0 V battery is entered on a cordless

tool, the tool is inherently expected to run on 18.0V. The clerk should not be allowed to type in A/C Voltage of 120V and select 18V for D/C Cordless tool. They must be guided to select cordless first. (**Figure-15)** shows the 'Add Tool' interface.

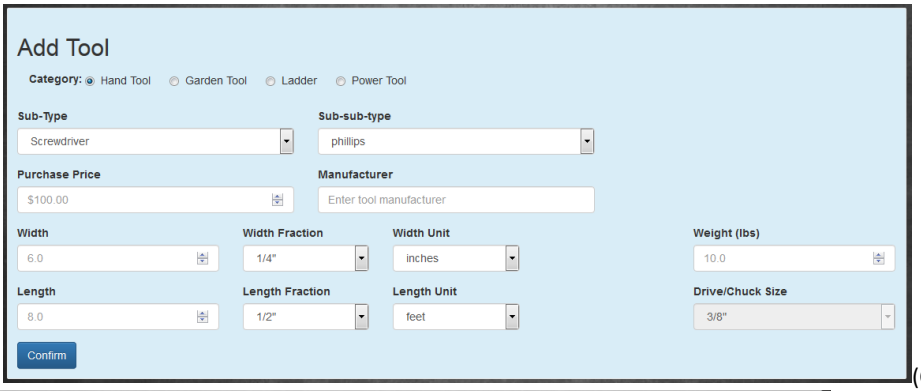
Tool dimensions: the available dropdown choices for **length** and **width units** will be **inches** or **feet only** (don't worry about metric units) where all dimensions are stored and displayed back to the user in 'tool details' in 'inches' format ("12-1/2 in. W x 15 in. L"). The precision of the system will allow entries of fractions dropdowns at **1/8 increments** (0, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8 only). Therefore a 5-1/4 in. wide tool would be entered as '5' under width value, clerk selects "1/4" from dropdown fraction list, and selects 'inches' from width unit dropdown list, the database will store this as '5.25' inches and display final output as "5-1/4 in. W". Another example with different unit for length, if the clerk enters '3', then '1/2', then selects '**feet'** from dropdown, the application will convert and store the length value as '42.0' **inches** in the database and display the output to the UI as "42 in. L" (no fraction after conversion). Now if the clerk selected the 3 and **1/8** feet fraction, the final output would include an fraction after conversion: "37-1/2 in. L" (0.125 x 12" = 1.5").

Power Tools: **Amp**, **Volt, and Power** unit dropdowns include both **milli** (1.0×10^{-3}), (1.0×10^{1}), and **kilo** (1.0×10^{3}) conversions. This means if a Clerk enters '10' in the volt-value and chooses 'milli-volts' from volt-unit dropdown**,** the **system will convert the entry** and **store it** in the database as the **standard unit** of **'0.01' Volts.** All amp, volt, and power values will be displayed back to the user as (1.0×10^{1}) values. Since chuck/drive size and gauges are relatively standardized, the system will have dropdowns for these: (1/4", 1/2", 3/8", 3/4" for chucks and 18G, 20G, 22G, 24G for gauges). Cordless battery dropdowns contain: 'Li-Ion' *OR* 'NiCd' *OR* 'NiMH' options only.

Note: In the case of **variable speed** power tools, there will be **two entries** for rpm/torque-rating: one for the min and one for the max. For a fixed speed tool, the Clerk only needs to enter a single minimum value. **A/C voltage** choices include: 110V, 120V, 220V and 240V.

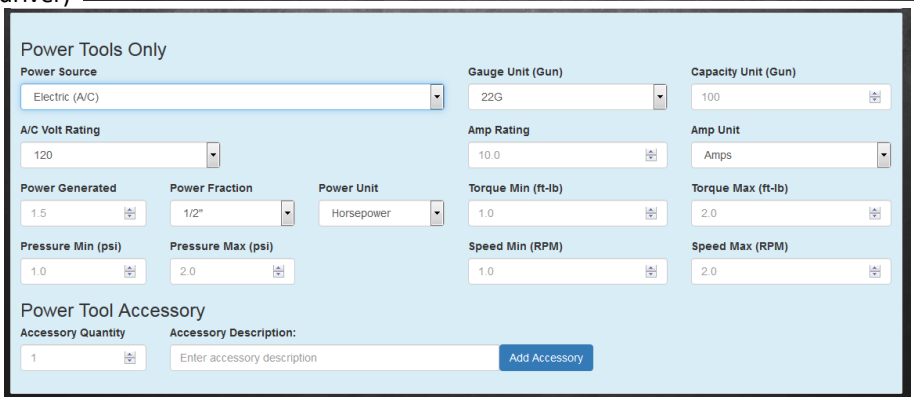
The Clerk should not be allowed to choose a sub-type without **first selecting a category** and **power-source**. Data input fields which are not valid based on tool category, power source, and sub-type selected (in that order) are to be **hidden/disabled** to prevent data corruption. For this project we assume the Database Administrator (you) have already setup the correct tool type/sub-subtype constraints for the Clerk to choose from. Both **power-source** and **sub-types** are predetermined drop down lists which guide the Clerk to the correct sub-sub-type combinations (e.g. power → cordless → trimmer → hedge). Clerks must select the Sub-Type before being allowed to select the more specific child sub-sub-types. Selections in each sub-sub-type dropdown menu based on the parent sub-type selected and *dynamically* determined in the previous step. The point of this is to prevent data corruption: for example, the Clerk should not be allowed to enter a gas-powered 2-wheeled hammer. **Appendix 1** shows all combinations/constraints required for this project.

(if Hand Tool & Screwdriver)



(Chuck disabled)

(if Power Tool selected)



(some may be disabled)

(If Cordless is selected)

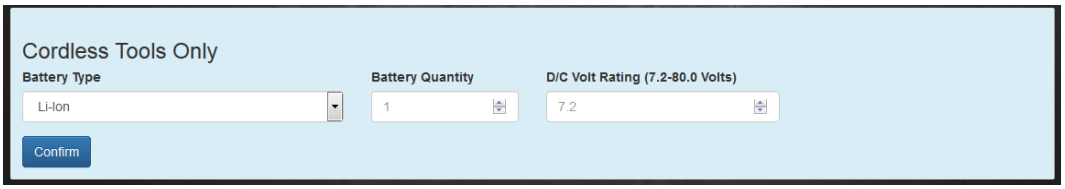


***Figure 15 - Add Tool** (showing Accessory additions available for Power Tools only)*

Repair Tool (create new Service Order record in Clerk role):

Some tools are too expensive to replace when they develop mechanical problems, and need to be sent off for repair. The Clerk is also responsible for filling out a **service order request** (**Figure-17**). While the tool is not 'available' for rent during the dates the tool is "in-repair". Once a service order is confirmed, a new repair record is created which tracks the tool number, Clerk who entered the service request, service cost, service start date, and service end date. Once the end date of service passes midnight or if the Clerk hits the 'fix-me' button, that tool is automatically added back to the '**available'** inventory. The same functionality for locating a tool to repair by dates, tool category, power-source/sub-types, and/or keyword applies in this interface. If an service order exists for a specific tool, a Clerk cannot enter a duplicate service request on the same tool (even in the future).

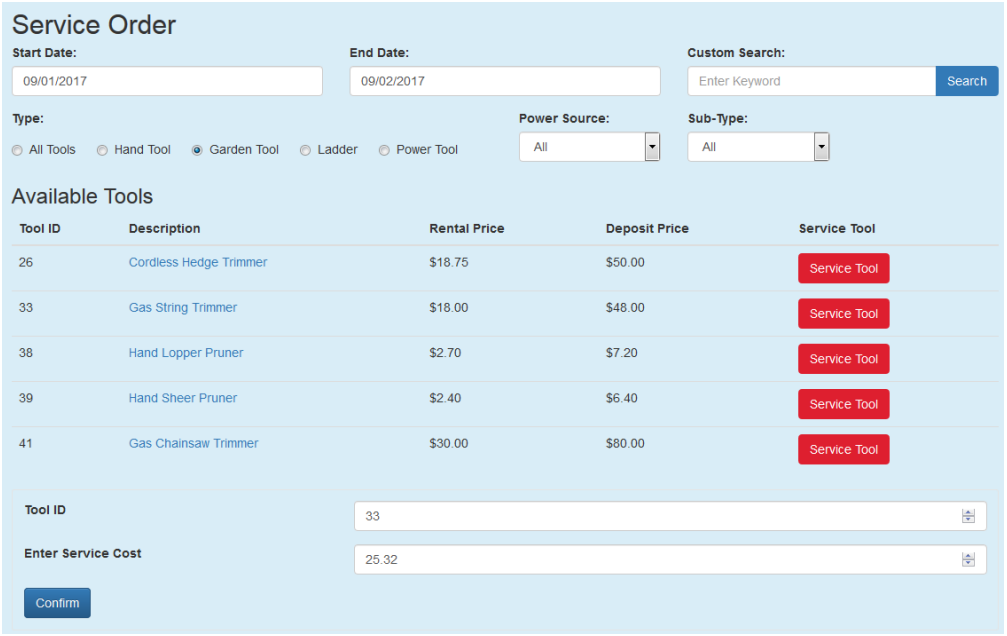


Figure 17- Service Order Request

View Service Status Page: (Clerk role)

This in an administrative interface allowing Clerks **to view/filter/override the current status of all tools in repair**. On this page, every tool has a '**in-repair'** (RED) icon/flag in the user interface (**Figure-18**). For each 'in-repair' tool in a given row, a (GREEN) "**fix-now**" button appears which allows the Clerk to manually override the 'in-repair' status for the purposes of the demo. The "**fix-now**" will update the repair end date to 'now()' and return that tool back into 'available' inventory and drop off the service status page list. For this project, the Clerk on record will be overwritten by the Clerk performing the override (this *may* be different than the Clerk who originally marked the tool for sale). All columns on the service status page are **sortable (ascending/descending)** by any field the user selects (service/tool ID, short-description, repair start date, *current* repair end date, repair cost (set before by Clerk on 'Sell-Tool" UI), username of Clerk who marked the tool for sale, and 'Fix-now' in-row button). Additionally, Clerks can restrict the results of the tool status page by any combination of input: filter by Clerk usernames, sort by dates, repair cost < or > $X.XX, keyword description.

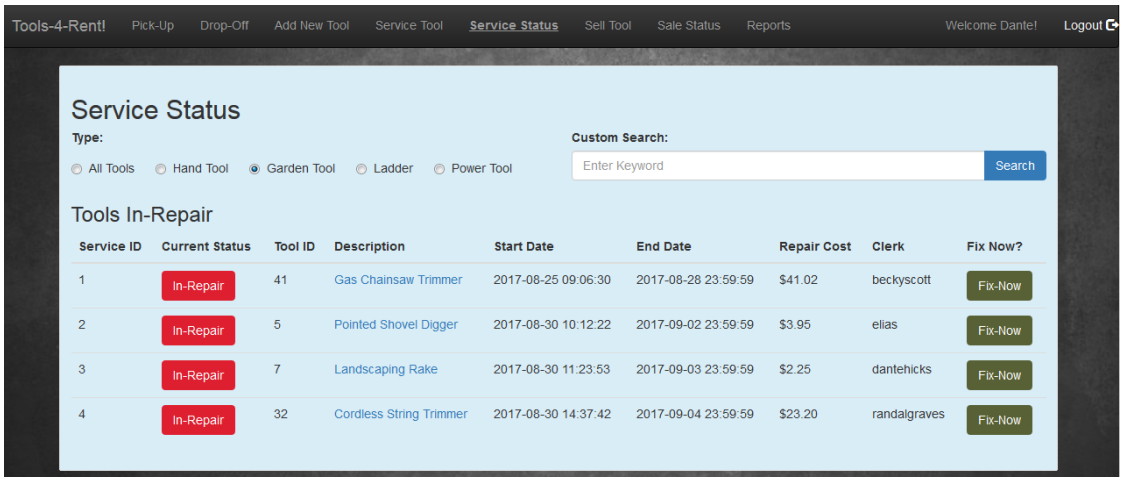


Figure 18- Service Status

Sell Tool (mark tool 'for-sale' and create new Sale record in Clerk role):

As new tools are added to the inventory, old tools need to be **taken out of circulation**. Prior analysis has shown the cost to maintain older tools outweighs the profits. When **tools are rented 50 times**, they are **automatically marked "for-sale" by the system**, therefore the number of times a tool is rented needs to be tracked. As soon as the 50th rental is returned, that tool is automatically marked 'for-sale' in the store at **50% of the original purchase price** (rounded *up* to nearest cent). In the case of the automated 50th entry, the 'clerk' in this case will be "**Jill Watson"** (jwatson@tools4rent.com, clerk_id=1, doh: 11/10/2016) the system's automated virtual clerk.

If a Clerk wants to manually mark a tool 'for-sale', they use the "Sell Tool" interface (**Figure-16**), select the tool, and hit correct "Sell-Tool" button. Clerks can restrict the search results of the sell tool page by any combination of input: filter by rental price, deposit price, keyword tool short-description, tool category, power-source/sub-types, and/or specific date range. Once selected, a new unique sale transaction number is created which tracks the tool number, customer who bought the tool, clerk who marked tool 'for sale', sale price, for-sale date, and sale date. Note: the actual sale date will be filled in whenever the Customer purchases a tool marked 'for-sale' on the Customer's "Purchase Tool" UI. If a tool has not been previously marked 'for-sale' by a clerk, the customer cannot purchase it.

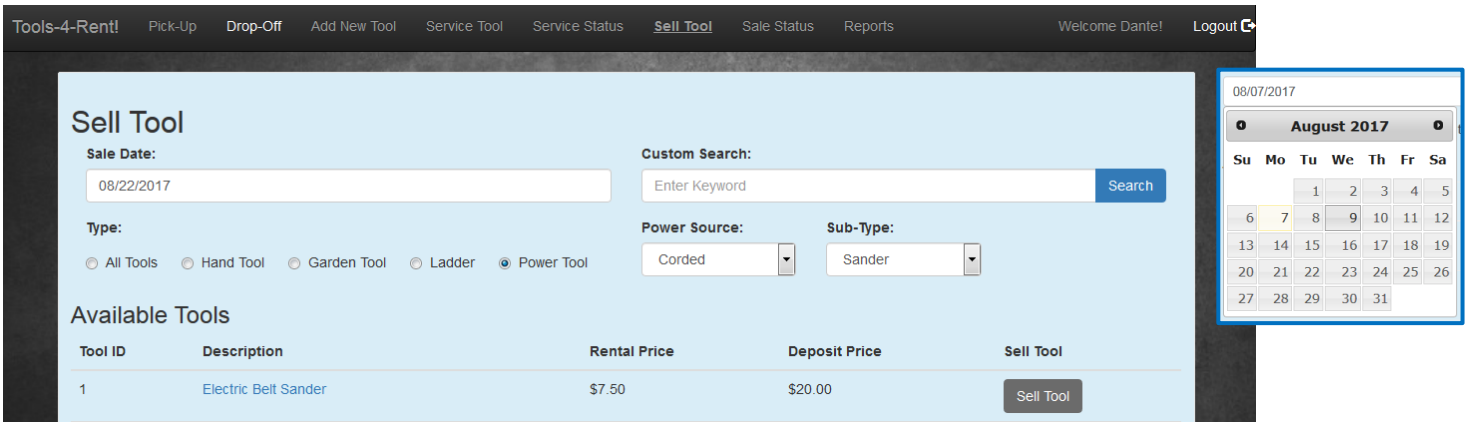


Figure 16 – Sell Tool – with Date Picker and power-source /sub-type dropdown sections

View Sale Status Page: (Clerk role)

This in an administrative interface is very similar to the "service status" page (**Figure-19**) and allows **Clerks to view/filter tools** marked **'for-sale'** or **'sold'** in the system. On this page, every tool should only have a status: **'for-sale'** (GREY), or **'sold'** (BLACK) showing applicable colors in the user interface. All columns on the tool status page are **sortable (ascending/ descending)** by any field the user selects (sale ID, tool ID, *colored* tool status (either 'for-sale' or 'sold'), short-description (aggregate), username of Customer who bought tool (if sold), sale price, sale date (if sold), Clerk who marked tool 'for-sale'). If there is no Customer bought the tool marked for sale, that portion (date and username) of the row entry is blank. Additionally, Clerks can restrict the results by any combination of input: filter by customer usernames, sale price < or > $X.XX, and/or keyword description.

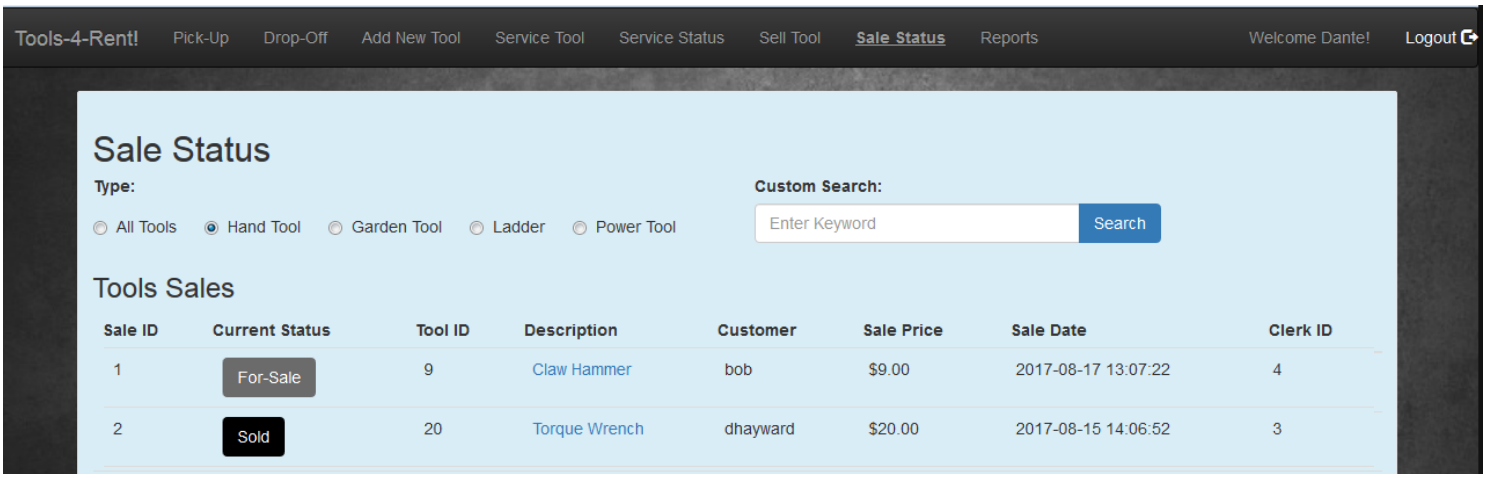


Figure 19- Sale Status

Generate Reports: (Clerk role)

Three reports are generated monthly by the system to summarize the success of Tools-4-Rent! (**Figure-20**).

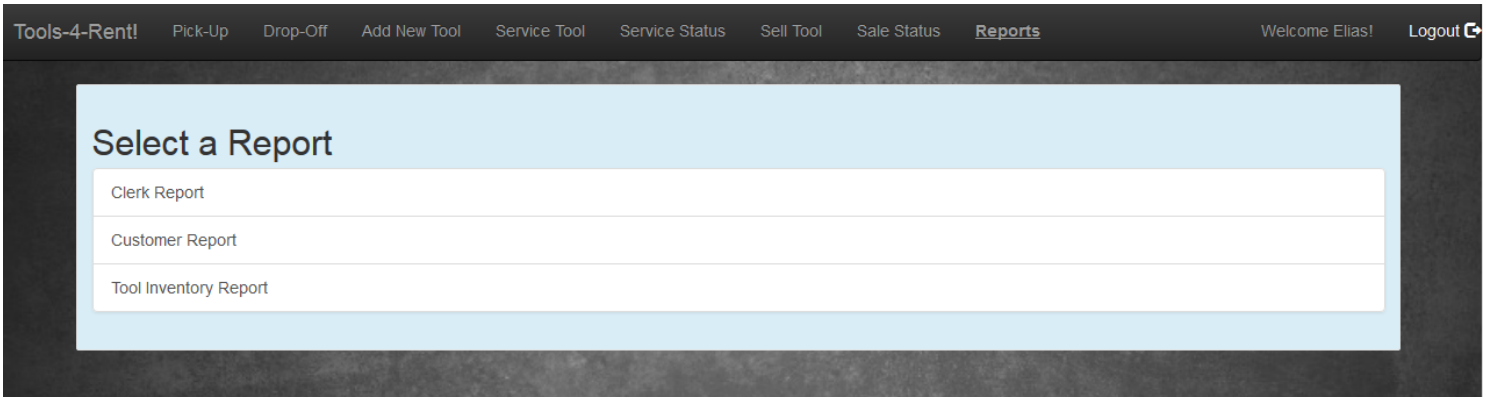


Figure 20 –Report Options

The **first report** is for **Clerks to track their own progress** in achieving this month's "Clerk-of-the-month". The report lists the Clerk employee number, full name, email, hire date (format: MM/DD/YYYY), the number of pick-ups handled this month, the number of drop-offs handled this month, and the sum of the two. It is **ordered** by the total number of pick-ups and drop-offs. (**Figure-21**).

Clerk Report

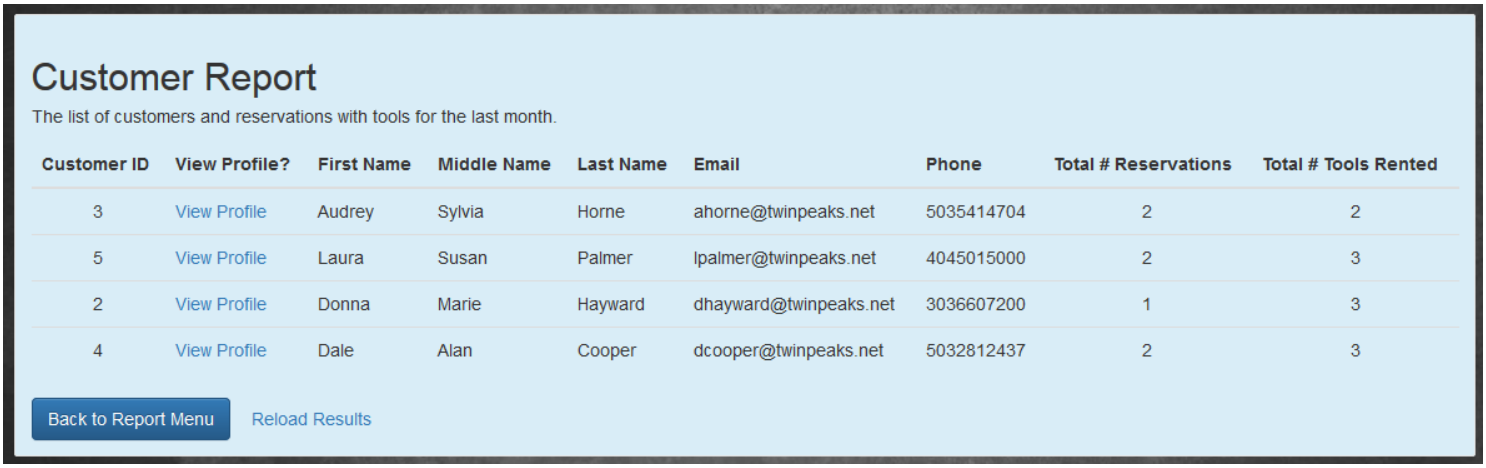
The list of clerks where their total pickups and dropoffs are shown for the past month.

Clerk ID	First Name	Middle Name	Last Name	Email	Hire Date	Number of Pickups	Number of Dropoffs	Combined Total
3	Elias	Bots-4-Ever!	Grover	elias@tools4rent.com	09/01/2016	2	1	3
2	Becky	Get-to-work!	Scott	beckyscott@tools4rent.com	09/01/2013	2	1	3
4	Dante	Why-Me?!?	Hickes	dantehicks@tools4rent.com	09/01/2007	1	0	1
5	Randal	Whatever...	Graves	randalgraves@tools4rent.com	09/01/2007	0	1	1
1	Jill	Al	Watson	jwatson@tools4rent.com	11/10/2016	0	0	0

Back to Report Menu Reload Results

Figure 21 – Clerk Report Options

The **second report** is a **list of all rental Customers** who rented a tool over the last month. Their usernames, link view their full profile, full names, email address, their *primary* phone number (may be home, work, cell, or other), and number of rentals are printed, and the list is **ordered** first by number of tools rented, then last name of the customer (**Figure-22**).



Customer Report

The list of customers and reservations with tools for the last month.

Customer ID	View Profile?	First Name	Middle Name	Last Name	Email	Phone	Total # Reservations	Total # Tools Rented
3	View Profile	Audrey	Sylvia	Horne	ahorne@twinpeaks.net	5035414704	2	2
5	View Profile	Laura	Susan	Palmer	lpalmer@twinpeaks.net	4045015000	2	3
2	View Profile	Donna	Marie	Hayward	dhayward@twinpeaks.net	3036607200	1	3
4	View Profile	Dale	Alan	Cooper	dcooper@twinpeaks.net	5032812437	2	3

Back to Report Menu Reload Results

Figure 22 – Customer Report Options

The **final report** is a listing of **every item in inventory**, listing tool ID, current status of tool, relevant date (past date sold, future date expected to return from service, future date expected to return), short description, rental profit, cost of tool, and **total profit**. The rental profit is the rental price multiplied by the number of days that the tool has been rented. The cost of the tool is the original price of the tool, plus the cost of any service orders made on the tool. The total profit is the rental profit minus the cost of the tool. The list is ordered by the total profit made on each item. On this page, every tool should either have a status: '**available'** (GREEN), '**rented'** (YELLOW), '**in-repair'** (RED), '**for-sale'** (GREY), or '**sold'** (BLACK) status showing applicable colors in the user interface (**Figure-23**).

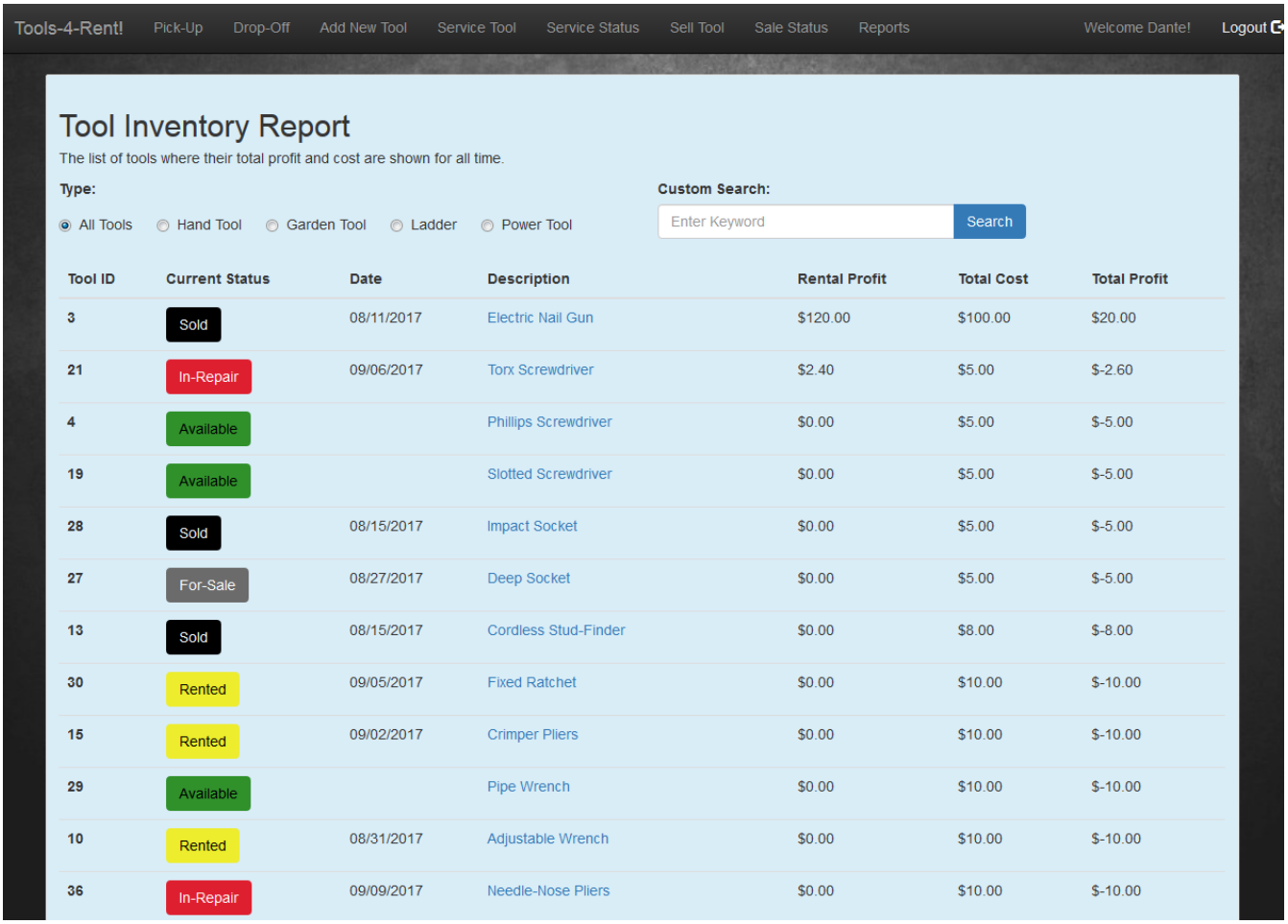


Figure 23 – Inventory Report

General Comments:

- Assume that all rentals are picked up and returned on time, there are **no cancellations** for any reason.
- A service order cannot be placed over an existing rental reservations, sale orders or service orders for same date.
- A sale order cannot be placed over an existing reservations, sale orders or service orders for same date. (no duplicates)
- The **short-description** for all UI headers is based on aggregate of data: [power-source]+[sub-sub-type (specialized)]+[sub-type (parent)]. *If power source type is 'Manual' it is not displayed* in the UI tool descriptions (links/tables).
- The **full-description** is highly variable to the tool instance: "[dimensions]+[power-source]+[sub-sub-type]+[*less specialized* sub-type (parent)] + […other descriptors…] + [manufacturer]"
- Users should only be allowed to enter valid data types for all input fields- numbers with decimal for price, strings for name, etc. Otherwise **notifications/alerts** should guide the user for correct data input (Date picker, whole numbers, etc.).
- **Deposit: 40%** of purchase price, **Rental: 15**% of purchase price, **Sale: 50%** of purchase price, and **Repair Cost**: Clerk's whim
- *Note*: 'one day' is defined as **12:00:00 AM-11:59:59 PM** for any given date in 24 hour increments (e.g. Customer's rental begins at 10:00:00AM on Monday, then returns at 9:59:59 AM Tuesday (less than 24 hours), that counts as 1 days' worth of rental. If the Customer returns the tool at 10:00:01 AM or later within the next 24 hour increment that counts as 2 days' worth of rental.
- All columns on all pages with tables are **sortable (ascending/descending)** by any field the user selects.
- ***Note***: the existence of Sale Orders and/or Service Orders should determine the 'status' of a tool for a given date. (Therefore, there should be no need to store/update a 'status' field for each instance of tool.) Write your queries based on this logic.
- The screenshots/figures are only meant to help clarify user interfaces (UIs) for the project, if there are discrepancies between the figures and project description, the **project worded description takes priority**, any inconsistencies are easily solved.
- Verbiage: **IFD 'documents'** should be used interchangeably with 'user interfaces', 'interfaces', or 'input forms'.
- Teams: feel free to customizing UIs/input forms based on team preference (font, layout, etc.) beyond the figures.
- Details on seed data required to demonstrate a functional app will be released later on Piazza.
- For phase 1 submission, please do not include 'clerk_id' or 'customer_id' on your EER or AC submission. These **surrogate keys** will be used for *phase 2 EER/AC+SQL submission only*.
- It is recommend teams use a script to add 'seed' data to the system for testing which can easily be expanded if needed. Refer to the GTOnline project for an example Python script which creates random data and commits it to the database. Details on exactly what seed data (default state) needs to be present during your demo will be released as Phase 3 draws closer.

Usage Statistics:

- For each store, it is expected that new online service will handle about 200 reservations per day.
- On average, 3 tools are rented out for each reservation.
- It is expected that the new online service will expand the Customer base for each store to about 100,000 registered Customers.
- 2/3rds of the reservations will be made by returning Customers.
- The tool inventory available for rent currently consists of 6000 separate tools in each store.
- New tools are added to the inventory at a rate of 10x/week.
- Old tools are put up for sale at a rate of 10x/week.
- Clerks are able to override service requests status at any time.

Revision History:

v1.0	Notes: Initial release for Phase 1	*Finalized:* 8/31/2017
V1.0.1		

Appendix 1:

The *Tools-4-Rent!* service will have **4 categories of tools** available for rental: **Hand Tools, Garden Tools, Ladders**, and **Power Tools**. Tools are also divided into 4 separate sub-types based on **power source**: 110-240 Volt A/C electric (corded), 7.2-80.0 Volt D/C battery powered (cordless), gas-powered, and manual (no motor).

Category: Hand Power Source Type:	Sub-Type	Sub-sub-type
(Manual only)	**Screwdriver**	phillips (cross) hex torx slotted (flat)
(Manual only)	**Socket**	deep impact standard
(Manual only)	**Ratchet**	adjustable fixed
(Manual only)	**Wrench**	crescent torque pipe
(Manual only)	**Pliers**	needle nose cutting crimper
(Manual only)	**Gun:**	nail staple
(Manual only)	**Cutting**	bolt cutter hack saw utility saw
(Manual only)	**Hammer**	claw sledge framing

Category: Garden Power Source Type:	Sub-Type	Sub-sub-type
(Manual only)	**Digger**	pointed shovel flat shovel scoop shovel
(Gas only)		gas-auger
(Gas only)		gas-cultivator
(All Power Source Types)		edger
(Manual only)	**Pruner**	sheer loppers
(A/C, D/C, or Gas only)	**Trimmers**	string hedge chainsaw
(Manual only)	**Rakes**	leaf (tine count) landscaping rock
(Manual only)	**Wheelbarrows**	1-wheel 2-wheel
(Manual only)	**Striking**	bar pry rubber mallet tamper pick axe single bit axe

Category: Ladder Power Source Type:	Sub-Type	Sub-sub-type
(Manual only)	Straight	rigid telescoping
(Manual only)	Step	folding multi-position

Accessories:	(paired with power tool)	
	Drill Bits	
	Saw Blade	
	Soft Case	
	Hard Case	
D/C	Batteries	7.2-80V
D/C	Battery Charger	
	Safety	hat
		pants
		goggles
		vest
	Hose	
	Gas Tank	

Category: Power Power Source Type:	Sub-Type	Sub-sub-type
Either: (A/C or D/C only)	**Drill**	driver hammer
Either: (A/C or D/C only)	**Saw**	circular reciprocating jig
Either: (A/C or D/C only)	**Sander**	finish sheet belt random orbital
(D/C only)	**Meter**	multi voltage distance
Either: (A/C or Gas)	**Air-Compressor**	
Either: (A/C or Gas)	**Mixer**	concrete
(Gas only)	**Generator**	electric

Revised: 9/1/2017

For this project we will assume any tool related to **outside for landscaping work** is a **"Garden" Tool.** Whereas any artificially powered tool which is presumably used **indoors for construction** will be considered a "**Power" Tool.**

Quick Fact: "At this time, only three countries—Burma, Liberia, and the US—have not adopted the International System of Units (SI, or metric system) as their official system of weights and measures." **Source**: https://www.cia.gov/library/publications/the-world-factbook/appendix/appendix-g.html