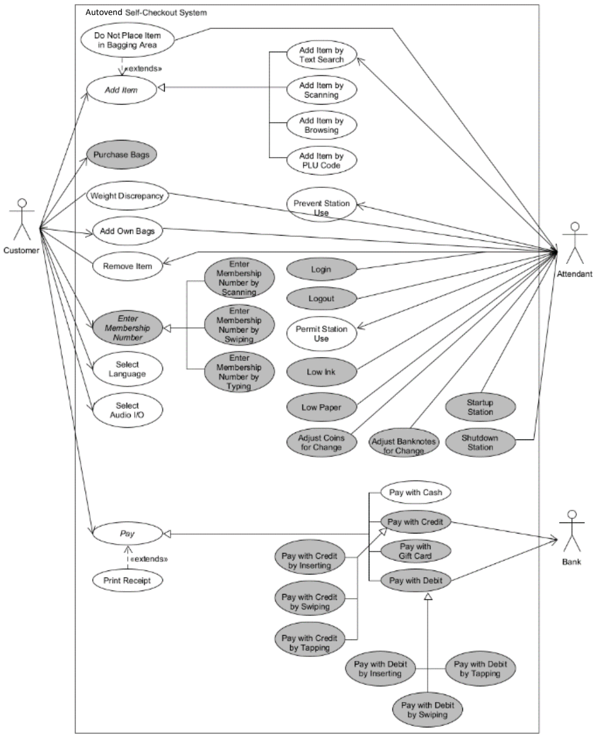
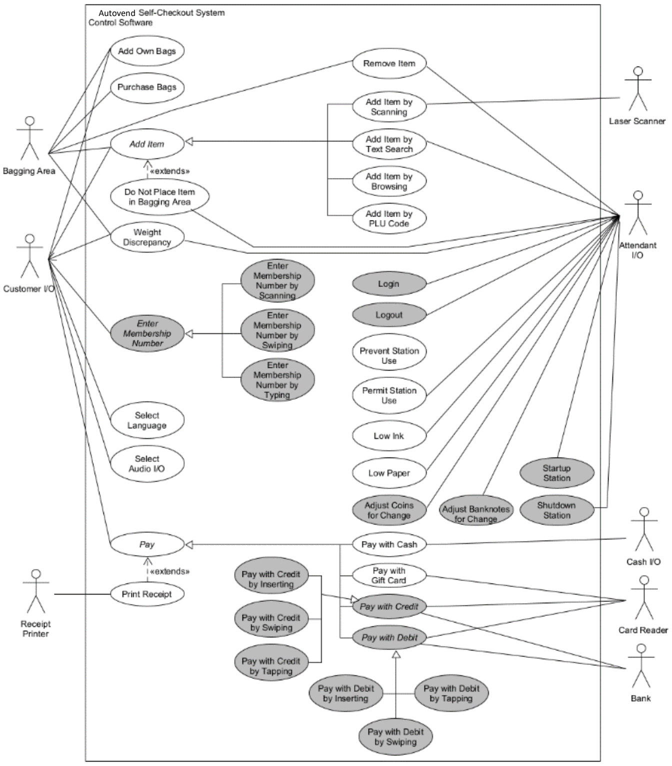
Autovend Self-Checkout System Use Cases (v3.0)



The use case diagram to the left represents the overall system, software and hardware. The actors that interact with the system are therefore the Customer and Attendant (humans) and Bank.

This diagram is important for the hardware department to understand what hardware is needed to interact with the external context and to support the use cases.



The second use case diagram is drawn from the perspective of just the software portion of the self-checkout system. Therefore, the actors are portions of the hardware plus the Bank, and the Customer and Attendant have gone away. Customer I/O and Attendant I/O each represents a combination of touch screen, speaker, and microphone.

The use case descriptions to follow will be relative to the software.

Use Case Descriptions

<table>
<tr><td><b>Use case</b>:</td><td><i>Add Own Bags</i></td></tr>
<tr><td><b>Primary actor</b>:</td><td>Customer I/O.</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To allow the customer to add their own bags to the bagging area without causing a weight discrepancy.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>The system is ready to detect weight discrepancies.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The customer decides to make use of their own bags, activating an appropriate control on their I/O.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. Customer I/O: Signals that the customer wants to add their own bags.
2. System: Indicates that the customer should add their own bags now.
3. Customer I/O: Signals that the customer has finished adding their own bags.
4. Bagging Area: Signals to the System the weight change.
5. System: Blocks the self-checkout station from further customer actions.
6. System: Signals to the Attendant I/O the need to approve the added bags.
7. Attendant I/O: Signals approval of the added bags.
8. System: Unblocks the self-checkout station.
9. System: Signals to the Customer I/O that the customer may now continue.</td></tr>
<tr><td colspan="2"><b>Exceptions</b>:
1. The System is not ready to note weight discrepancies.
2. The attendant does not want to approve the added bags. Presumably, the attendant is aware that the customer has done something improper and communicates directly with customer about the issue. The attendant should thus be able to cancel the request once the customer eliminates the weight discrepancy.</td></tr>
<tr><td><b>Priority</b>:</td><td>Low, can be skipped without major impact on system operation.</td></tr>
<tr><td><b>When available</b>:</td><td>Second iteration.</td></tr>
<tr><td><b>Frequency of use</b>:</td><td>Many times per day.</td></tr>
<tr><td><b>Channel to actor</b>:</td><td>Hardwired connection.</td></tr>
<tr><td><b>Secondary actors</b>:</td><td>Bagging Area, Attendant I/O.</td></tr>
<tr><td colspan="2"><b>Channels to secondary actors</b>:
Bagging Area: Hardwired connection.
Attendant I/O: Local area network.</td></tr>
<tr><td colspan="2"><b>Open issues</b>:
1. It is not clear why the System might not be ready to note weight discrepancies. Once it has completed its startup, each station ought to be ready for customer use.</td></tr>
</table>

<table>
<tr><td><b>Use case</b>:</td><td><i>Purchase Bags</i></td></tr>
<tr><td><b>Primary actor</b>:</td><td>Customer I/O.</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To allow the customer to purchase reusable bags, and to add these to the bagging area without causing a weight discrepancy.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>The system is ready to detect weight discrepancies.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The customer decides to purchase reusable bags, activating an appropriate control on their I/O.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. Customer I/O: Signals that the customer wants to purchase bags, indicating how many.
2. System: Adds the reusable bags to the customer's bill.</td></tr>
</table>

3. System: Signals to Bag Dispenser the number of bags to dispense. 4. System: Increases expected weight by the expected weight of each bag. 5. Bagging Area: Signals to the System the weight change. 6. System: Signals to the Customer I/O that the operation is complete. 7. Customer I/O: Ready for additional customer interaction.	
Exceptions: 1. The System is out of bags, so the purchase does not proceed. 2. The weight of the bags is different than the expected weight; see **Weight Discrepancy**.	
Priority:	Low, can be skipped without major impact on system operation.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired connection.
Secondary actors:	Bagging Area, Bag Dispenser.
Channels to secondary actors: Bagging Area: Hardwired connection. Bag Dispenser: Hardwired connection.	
Open issues: 1. If the station is out of bags, can they be purchased from the attendant or added to the bill and dispensed manually by the attendant, or does the attendant need to refill the dispenser?	

Use case:	*Remove Item*
Primary actor:	Attendant I/O.
Goal in context:	To remove an item from a customer's bill, allowing them to also remove it from the bagging area without causing a weight discrepancy.
Preconditions:	The system is ready to detect weight discrepancies.
Trigger:	The customer wishes to eliminate an item from their bill, communicating this to the attendant.
Scenario: 1. Attendant I/O: Signals that a specific item is to be removed from the customer's bill. 2. System: Blocks the self-checkout station from further customer actions. 3. System: Removes the item from the customer's bill, reducing the expected weight in the bagging area. 4. System: Signals to the Attendant I/O that the bill removal was successful and that the item should be removed from the bagging area. 5. System: Signals to the Customer I/O that the item should be removed from the bagging area. 6. System: Unblocks the self-checkout station.	
Exceptions: 1. The System is not ready to note weight discrepancies. 2. The item is not removed from the bagging area; see **Weight Discrepancy**.	
Priority:	Medium, necessary for good customer service and to avoid having to cancel transactions entirely.
When available:	Third iteration
Frequency of use:	A few times per day.
Channel to actor:	Local area network.

Secondary actors:	Bagging Area, Customer I/O.
Channels to secondary actors: Bagging Area: hardwired, physical connection Customer I/O: local area network; physical connection	
Open issues: 1. Should the request be made verbally to the attendant? What if the customer and attendant do not speak the same language? Should the customer be able to indicate the item on their bill that they want to remove, with the attendant merely approving it and checking that the item be removed from the bagging area?	

Use case:	*Add Item*
Primary actor:	Customer I/O
Goal in context:	To allow the customer to add an item to their bill for purchase.
Preconditions:	The system is ready to detect weight discrepancies and to take customer input.
Trigger:	The customer wishes to add an item to their bill.
Scenario: 1. (Abstract use case) Details about the item to add must be provided to the System. 2. System: Blocks the self-checkout station from further customer interaction. 3. System: The expected weight in the Bagging Area is updated. 4. System: Signals to the Customer I/O to place the item in the Bagging Area. 5. <**No Bagging extension point**>. 6. Bagging Area: Signals the weight change from the added item. 7. System: Unblocks the station.	
Exceptions: 1. The customer fails to place the item in the Bagging Area; see **Weight Discrepancy**.	
Priority:	High, the system cannot function with this.
When available:	First iteration.
Frequency of use:	Every customer transaction.
Channel to actor:	Hardwired connection.
Secondary actors:	Bagging Area.
Channels to secondary actors: Hardwired connection.	
Open issues: The manner in which the customer can indicate what is to be added is unclear. It seems reasonable that barcode scanning would be the default and so the system needs to be ready to scan each item unless an alternative means for providing the information is explicitly selected.	

Use case:	*Add Item by Scanning*
Primary actor:	Laser Scanner
Goal in context:	To permit the customer to scan a barcode of an item to add it to their bill for purchase.
Preconditions:	The system is ready to accept customer input.
Trigger:	The customer wishes to scan a barcode on an item that possesses one.
Scenario: 1. Laser Scanner: Detects a barcode and signals this to the System.	

2. System: Blocks the self-checkout station from further customer interaction. 3. System: Determines the characteristics (weight and cost) of the product associated with the barcode. 4. System: Updates the expected weight from the Bagging Area. 5. System: Signals to the Customer I/O to place the scanned item in the Bagging Area. 6. Bagging Area: Signals to the System that the weight has changed. 7. System: Unblocks the station.	
Exceptions: 1. The weight in the Bagging Area does not correspond to expectations; see **Weight Discrepancy**. 2. An item is scanned when a customer session is not in progress. The scanned information shall simply be ignored.	
Priority:	High, must be implemented.
When available:	Iteration 1.
Frequency of use:	Every customer transaction.
Channel to actor:	Hardwired connection.
Secondary actors:	Bagging Area, Customer I/O.
Channels to secondary actors: Bagging Area: Hardwired connection. Customer I/O: Hardwired connection.	
Open issues: None.	

Use case:	*Add Item by Text Search*
Primary actor:	Attendant I/O.
Goal in context:	To permit the attendant to add an item to the customer's bill for purchase, knowing details of the item that are not available to the customer (such as the name used by the organization to describe the item's product). This is important if a barcode or PLU code is absent or not recorded within the system.
Preconditions:	The system is ready for attendant input and a customer session is in progress at a connected self-checkout station.
Trigger:	The customer has asked the assistance of the attendant in adding an item to their bill for purchase.
Scenario: 1. Attendant I/O: The station is selected on which the relevant customer has a session. 2. Attendant I/O: Permits the attendant to search for a product by specifying some text; this should be used as a keyword search in case a product's name is in a different order than expected by the attendant. 3. Attendant I/O: Displays the results of the search. If the results are satisfactory for the attendant, proceed to 3, else return to 1. 4. Attendant I/O: A product in the displayed results is selected for addition. 5. System: Blocks the self-checkout station from further customer interaction. 6. System: Adds the product to the customer's bill, updates the expected weight. 7. System: Signals to the Customer I/O that the item should be added to the Bagging Area. 8. Bagging Area: Signals to the System that the weight has changed. 9. System: Unblocks the station.	
Exceptions:	

1. The weight in the Bagging Area does not correspond to expectations; see **Weight Discrepancy**.	
Priority:	Medium, should be implemented as the system will not function well without it.
When available:	Third iteration.
Frequency of use:	A few times per day.
Channel to actor:	Hardwired.
Secondary actors:	Bagging Area, Customer I/O.
Channels to secondary actors: Bagging Area: Local area network. Customer I/O: Local area network.	
Open issues: 1. Text search is impractical without a physical keyboard. Presumably the attendant I/O will have to possess a physical keyboard but not the individual self-checkout stations.	

Use case:	*Add Item by Browsing*
Primary actor:	Customer I/O.
Goal in context:	To allow the customer to look through a visual catalogue of products to select the one for which they wish to add an item for purchase.
Preconditions:	The system is ready for customer input.
Trigger:	The customer does not have a PLU code or barcode available for an item, but they want to add the item to their purchase.
Scenario: 1. Customer I/O: Displays the visual catalogue, allowing the customer to browse through it. 2. Customer I/O: The customer selects the product of interest. 3. Customer I/O: Signals to the customer to place the item in the Bagging Area. 4. Customer I/O: Signals to the System that an item is to be added, indicating the information about the item. 5. System: Blocks the self-checkout system from further customer interaction. 6. Bagging Area: Signals to the System that the weight has changed. 7. System: Unblocks the self-checkout system.	
Exceptions: 1. The weight in the Bagging Area does not correspond to expectations; see **Weight Discrepancy**.	
Priority:	High, must be implemented for the system to function-well.
When available:	Third iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Bagging Area.
Channels to secondary actors: Bagging Area: Hardwired.	
Open issues: 1. The form of the visual catalogue and the manner in which one could browse it are vague. Should it be in alphabetical order, where all products starting with a given letter are displayed? Should it be done like in Netflix, arranged roughly be category with a long list of images that can be scrolled through?	

Use case:	*Add Item by PLU Code*

<table>
<tr><td><b>Primary actor</b>:</td><td>Customer I/O</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To permit the customer to type a known PLU code in order to add an item.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>The system is expecting a customer to enter a PLU code.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The customer has an item with a PLU code and they want to add this item to their bill.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. Customer I/O: Displays a virtual numeric keyboard.
2. Customer I/O: Accepts the customer’s input of the PLU code.
3. Customer I/O: Signals to the System that an item with a given PLU code is being added.
4. System: Blocks the self-checkout station from further input.
5. Customer I/O: Signals to the customer to add the item to the Bagging Area.
6. Bagging Area: Signals the System that the weight has changed.
7. System: Unblocks the station.
8. Customer I/O: Returns to its standard display.</td></tr>
<tr><td colspan="2"><b>Exceptions</b>:
1. The weight in the Bagging Area does not correspond to expectations; see <b>Weight Discrepancy</b>.</td></tr>
<tr><td><b>Priority</b>:</td><td>High, must be implemented.</td></tr>
<tr><td><b>When available</b>:</td><td>Third iteration.</td></tr>
<tr><td><b>Frequency of use</b>:</td><td>Many times per day.</td></tr>
<tr><td><b>Channel to actor</b>:</td><td>Hardwired.</td></tr>
<tr><td><b>Secondary actors</b>:</td><td>Bagging Area.</td></tr>
<tr><td colspan="2"><b>Channels to secondary actors</b>:
Bagging Area: Hardwired.</td></tr>
<tr><td colspan="2"><b>Open issues</b>:
1. Simple mechanisms for self-correction by the customer, like a backspace key, should be supported.
2. The customer ought to have the opportunity to see that the PLU does not correspond to their item. At this point, communication with the attendant is likely the best option for correcting the problem.</td></tr>
</table>

<table>
<tr><td><b>Use case</b>:</td><td><i>Do Not Place Item in Bagging Area</i></td></tr>
<tr><td><b>Primary actor</b>:</td><td>Customer I/O.</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To permit the customer to avoid placing an item in the bagging area, presumably because it is too big or too heavy.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>The system is expecting the customer to place an item in the bagging area.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The customer signals to the Customer I/O that they do not want to bag their item.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. System: Blocks the self-checkout station from further customer input.
2. System: Signals to the Attendant I/O that a no-bagging request is in progress.
3. Attendant I/O: Signals to the System that the request is approved.
4. System: Reduces the expected weight in the Bagging Area by the expected weight of the item.
5. System: Unblocks the station.</td></tr>
<tr><td colspan="2"><b>Exceptions</b>:
1. The customer adds the item to the Bagging Area anyways; see <b>Weight Discrepancy</b>.</td></tr>
<tr><td><b>Priority</b>:</td><td>Medium, should be implemented to avoid legal consequences of a customer becoming injured due to moving a heavy item or as a result of collision with a bulky item.</td></tr>
<tr><td><b>When available</b>:</td><td>Third iteration.</td></tr>
</table>

Frequency of use:	A few times per week.
Channel to actor:	Hardwired.
Secondary actors:	Attendant I/O.
Channels to secondary actors: Attendant I/O: Local area network.	
Open issues: 1. Care has to be taken to ensure that “blocking the station” does not inhibit the customer from making this request.	

Use case:	*Weight Discrepancy*
Primary actor:	None.
Goal in context:	To react to a difference in the actual weight of the bagging area and the expected weight, due to items being moved improperly into or out of the bagging area, or due to true weights differing from ideal weights or measured weights.
Preconditions:	The system is in the midst of a customer’s session.
Trigger:	The Bagging Area informs the System of its current weight, and the System deems that this weight is unacceptably different from expectations.
Scenario: 1. System: Blocks the self-checkout station from further customer interaction. 2. System: Signals the Customer I/O regarding the weight discrepancy. 3. System: Signals the Attendant I/O regarding the weight discrepancy. There are three options: a. Bagging Area: Notifies the System about a weight change [if the customer adds or removes an item in response]; OR, b. Customer I/O: Signals the System about a do-not-bag request (see **Do Not Place Item in Bagging Area**); OR, c. Attendant I/O: Signals the System of a weight-discrepancy approval.	
Exceptions: 1. If the attendant does not approve the weight discrepancy, they will need to manually investigate what has been placed in the Bagging Area and what is supposed to be there. 2. If the weight change from the Bagging Area still does not concur with expectations, the weight discrepancy will continue.	
Priority:	High, must be implemented for the system to function.
When available:	Second iteration.
Frequency of use:	Potentially constant.
Channel to actor:	N/A.
Secondary actors:	Bagging Area, Customer I/O, Attendant I/O.
Channels to secondary actors: Bagging Area: Hardwired. Customer I/O: Hardwired. Attendant I/O: Local area network.	
Open issues: 1. If the scale is untrustworthy, spurious weight discrepancies will occur, upsetting customers and attendants alike. 2. Scales cannot be trusted 100%, so it is important that attendants be attentive to the stations, and that they be provided with the means to correct problems.	

Use case:	*Enter Membership Number*
Primary actor:	Customer I/O.
Goal in context:	To provide the system with details of the customer’s membership.
Preconditions:	The system has to be ready to accept customer input.
Trigger:	The customer wishes to provide their membership details.
Scenario: 1. <Abstract use case> Provide membership number. 2. Customer I/O: Ready for subsequent customer input.	
Exceptions: 1. Bad membership numbers should be detected and the customer informed about this. It is possible that they made a typographical error, or that what they believed to be their membership number is not correct. 2. The customer should be able to cancel the operation, rather than being forced to provide a valid number.	
Priority:	Medium, important for business context but not essential.
When available:	Second iteration.
Frequency of use:	Many times per day; most customer transactions.
Channel to actor:	Hardwired.
Secondary actors:	None.
Channels to secondary actors: N/A.	
Open issues: 1. What constitutes a valid membership number is unknown. As is whether we can expect those details to vary between stores. 2. How the customer can be aware of their membership number is unknown.	

Use case:	*Enter Membership Number by Swiping*
Primary actor:	Customer I/O.
Goal in context:	To provide the system with details of the customer’s membership.
Preconditions:	The system has to be ready to accept customer input.
Trigger:	The customer wishes to provide their membership details.
Scenario: 1. Customer I/O: Read card swipe information. 2. Customer I/O: Signal membership information to System. 3. Customer I/O: Ready for subsequent customer input.	
Exceptions: 1. Swipe failures have to be dealt with.	
Priority:	Medium, important for business context but not essential.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	None.
Channels to secondary actors:	

N/A.
Open issues: None.

Use case:	*Enter Membership Number by Scanning*
Primary actor:	Customer I/O.
Goal in context:	To provide the system with details of the customer’s membership.
Preconditions:	The system has to be ready to accept customer input.
Trigger:	The customer wishes to provide their membership details.
Scenario: 1. Customer I/O: Read card scan information. 2. Customer I/O: Signal membership information to System. 3. Customer I/O: Ready for subsequent customer input.	
Exceptions: 1. Scan failures have to be dealt with.	
Priority:	Medium, important for business context but not essential.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	None.
Channels to secondary actors: N/A.	
Open issues: None.	

Use case:	*Enter Membership Number by Typing*
Primary actor:	Customer I/O.
Goal in context:	To provide the system with details of the customer’s membership.
Preconditions:	The system has to be ready to accept customer input.
Trigger:	The customer wishes to provide their membership details.
Scenario: 1. Customer I/O: Read membership number from typing on virtual keyboard. 2. Customer I/O: Signal membership information to System. 3. Customer I/O: Ready for subsequent customer input.	
Exceptions: 1. Typing mistakes have to be dealt with.	
Priority:	Medium, important for business context but not essential.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	None.
Channels to secondary actors: N/A.	
Open issues:	

None.

Use case:	*Select Language*
Primary actor:	Customer I/O.
Goal in context:	To allow the customer to interact with the system in a language of their choice.
Preconditions:	The system is ready for customer input.
Trigger:	The customer wishes to interact with the system in a particular language.
Scenario: 1. Customer I/O: Displays the language options available at the station. 2. Customer I/O: Signals to the System the selected language. 3. Customer I/O: Ready for further customer interaction.	
Exceptions: 1. If a desired language is not present, or if the customer changes their mind, the option to cancel should be available.	
Priority:	Low, may be skipped without a major impact on system usability.
When available:	Third iteration.
Frequency of use:	Infrequent; a few times per week.
Channel to actor:	Hardwired.
Secondary actors:	None.
Channels to secondary actors: N/A.	
Open issues: 1. How many languages must be supported? 2. Is the standard language to be English unless something else is selected? Or should this be a configuration setting when the system is installed? 3. How will this interact with the customer if they are vision-impaired? 4. The cost of maintaining the system and its attendant databases in additional languages could lead to unacceptably high costs. Poor translation could lead to customer misunderstanding or offense.	

Use case:	*Select Audio I/O*
Primary actor:	Customer I/O.
Goal in context:	To allow the customer to interact with the system in an auditory manner, speaking into a microphone and hearing from a speaker.
Preconditions:	The system is ready for customer input.
Trigger:	The customer desires to interact with the system verbally.
Scenario: 1. Customer I/O: Signals to the System that verbal interaction is to be used.	
Exceptions: None.	
Priority:	Low, as most customers can be expected to prefer verbal interaction. However, failure to provide this functionality could be legally challenged as discriminatory.
When available:	Third iteration.
Frequency of use:	Once a week.
Channel to actor:	Hardwired.

Secondary actors:	None.
Channels to secondary actors: N/A.	
Open issues: 1. Interacting with all the functions of the system verbally could be challenging, requiring significantly different user interface design. 2. Multiple stations using verbal interaction could lead to confusion for the system and for customers, especially if volume levels need to be elevated for some customers. 3. The costs of this additional development could be significant compared to the costs of the base functionality. 4. Presumably the customer should be able to change their mind and also switch back to visual/touch based interaction. 5. Should attendants also be able to interact verbally with their station? Failure to support this could be deemed as discriminatory hiring practices.	

Use case:	*Prevent Station Use*
Primary actor:	Attendant I/O.
Goal in context:	To prevent a station from being used by customers while it is undergoing maintenance.
Preconditions:	The system is otherwise ready for customer interaction. The station to suspend is not in the midst of a customer session.
Trigger:	The attendant needs to perform some sort of maintenance on the station.
Scenario: 1. Attendant I/O: The stations that can be suspended are indicated. 2. Attendant I/O: The specific station to suspend is selected. 3. Attendant I/O: Signals to the System to suspend the indicated station. 4. System: Signals to the Customer I/O of the indicated station that its interaction is suspended, preventing customer interaction.	
Exceptions: 1. The attendant should not be able to suspend a station in the midst of a customer session. If there is a technical problem with the station in the middle of a session, this may be unavoidable, and so the attendant should be able to force suspension even during a session. This should not end the session, so that the problem could be corrected, the station un-suspended, and session resumed without alteration.	
Priority:	Medium, necessary for maintenance purposes.
When available:	Third iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Customer I/O.
Channels to secondary actors: Customer I/O: Local area network.	
Open issues: 1. In some situations, it might make sense to simply cancel the customer session. There isn't currently a use case to support that.	

<table>
<tr><td><b>Use case</b>:</td><td><i>Permit Station Use</i></td></tr>
<tr><td><b>Primary actor</b>:</td><td>Attendant I/O.</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To again permit the use of a station by customers, after it has undergone some sort of maintenance.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>The station to be un-suspended must be currently suspended.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The attendant has finished basic maintenance on a station and wants to permit it to be used by customers again.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. Attendant I/O: The list of stations that can be un-suspended are displayed for selection.
2. Attendant I/O: Signals to the System which station is to be un-suspended.
3. System: Signals to the Customer I/O for the indicated station to un-suspend itself.
4. Customer I/O: Ready for further customer interaction.</td></tr>
<tr><td colspan="2"><b>Exceptions</b>:
1. If there is some problem by which the system cannot communicate with a station, it will have to remain suspended. By this can be enforced through physical protocols, like placing an “Out of Order” sign on the station.</td></tr>
<tr><td><b>Priority</b>:</td><td>Medium, necessary for maintenance purposes.</td></tr>
<tr><td><b>When available</b>:</td><td>Third iteration.</td></tr>
<tr><td><b>Frequency of use</b>:</td><td>Many times per day.</td></tr>
<tr><td><b>Channel to actor</b>:</td><td>Hardwired.</td></tr>
<tr><td><b>Secondary actors</b>:</td><td>Customer I/O.</td></tr>
<tr><td colspan="2"><b>Channels to secondary actors</b>:
Customer I/O: Local area network.</td></tr>
<tr><td colspan="2"><b>Open issues</b>:
None.</td></tr>
</table>

<table>
<tr><td><b>Use case</b>:</td><td><i>Pay</i></td></tr>
<tr><td><b>Primary actor</b>:</td><td>Customer I/O.</td></tr>
<tr><td><b>Goal in context</b>:</td><td>To permit the customer to pay for their items.</td></tr>
<tr><td><b>Preconditions</b>:</td><td>There are items on the customer’s bill for which sufficient payment has yet to be made.</td></tr>
<tr><td><b>Trigger</b>:</td><td>The customer wishes to pay for their items.</td></tr>
<tr><td colspan="2"><b>Scenario</b>:
1. (Abstract use case) The customer indicates the mode of payment that they want to use.
2. (Abstract use case) The customer provides payment, signalling this to the System.
3. System: The amount due is reduced by the payment.
4. System: Signals to the Customer I/O the remaining amount due.
5. Customer I/O: Update the amount due.
6. &lt;<b>Updated Amount Due extension point</b>&gt;.
7. Customer I/O: Ready for additional customer interaction.</td></tr>
<tr><td colspan="2"><b>Exceptions</b>:
1. If the payment is not made or not accepted, the remaining amount due is not reduced, but the customer session is otherwise unaffected.</td></tr>
<tr><td><b>Priority</b>:</td><td>High, must be implemented.</td></tr>
<tr><td><b>When available</b>:</td><td>First iteration.</td></tr>
</table>

Frequency of use:	Every customer transaction.
Channel to actor:	Hardwired.
Secondary actors:	Unknown.
Channels to secondary actors: N/A.	
Open issues: 1. Should the customer be forced to make full payment, or can they make partial payment and then return to adding/removing items?	

Use case:	*Pay with Cash*
Primary actor:	Cash I/O.
Goal in context:	To permit the customer to provide coins and/or banknotes as payment.
Preconditions:	The system has to be ready to take payment.
Trigger:	The customer has indicated that they want to pay cash for their bill.
Scenario: 1. Cash I/O: Signals the insertion of coins and banknotes to the System. 2. System: Reduces the remaining amount due by the value of the inserted cash. 3. System: Signals to the Customer I/O the updated amount due after the insertion of each coin or banknote. 4. Customer I/O: Updates the amount due displayed to the customer. 5. Continue with super use case.	
Exceptions: 1. If the customer inserts cash that is deemed unacceptable, this will be returned to the customer without involving the System, presumably handled in hardware. 2. If insufficient change is available, the attendant should be signalled as to the change still due to the customer and the station should be suspended so that maintenance can be conducted on it.	
Priority:	Medium, essential in some business contexts, undesired in others.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Customer I/O.
Channels to secondary actors: Customer I/O: Hardwired.	
Open issues: 1. The hardware has to handle invalid cash, to reject it without involving the control software.	

Use case:	*Pay with Credit*
Primary actor:	Customer I/O
Goal in context:	To allow the customer to pay their bill with a credit card.
Preconditions:	The system is ready to receive customer payment.
Trigger:	The customer wishes to pay with their credit card.
Scenario: 1. Customer I/O: Signals to System that a credit payment is to be made, and the amount of this. 2. System: Enables Card Reader.	

3. Card Reader: Receives the card and associated personal identification number (PIN). 4. Card Reader: Requests verification of the PIN by the credit card. 5. Card Reader: If the PIN is verified, signals to the Bank that a credit card transaction is to be conducted, providing the appropriate card data, and the amount desired. Else <**PIN failure extension point**>. 6. Bank: If the amount is approved, places a hold on the amount against the available credit for the account associated with the card. 7. Bank: Signals the hold number to the System. 8. System: Signals to the Bank to complete the transaction, communicating the hold number. 9. Bank: Records the transaction, releasing the hold and reducing the available credit for the account associated to the card. 10. System: Reduces the remaining amount due by the amount of the transaction. 11. System: Signals to the Card Reader to release the card. 12. Card Reader: Indicates that the card should be removed. 13. Card Reader: Signals to the System that the operation is complete. 14. System: Signals to Customer I/O that the operation is complete and the remaining amount due is reduced. 15. Continue with super use case.	
Exceptions: 1. If the Bank determines that the transaction should not be authorized, the system will be informed and it will not reduce the remaining amount due. 2. If communication with the Bank is faulty or interrupted, prior to the hold being authorized, the transaction will fail. 3. If communication with the Bank is faulty or interrupted after the hold being authorized, attempts to complete the transaction will be repeated every 20 seconds for 5 tries. If the transaction is not completed, the hold will be released and the remaining amount due will not change.	
Priority:	High, must be implemented.
When available:	First iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Card Reader, Bank.
Channels to secondary actors: Card Reader: Hardwired. Bank: Internet via secure protocol.	
Open issues: 1. To minimize repetition, this UC is described generically, but there are three modes for the customer to interact with the Card Reader: Inserting, Tapping, and Swiping. 2. How does the hold get released if the Bank cannot be contacted?	

Use case:	*Pay with Debit*
Primary actor:	Customer I/O
Goal in context:	To allow the customer to pay their bill with a debit card.
Preconditions:	The system is ready to receive customer payment.
Trigger:	The customer wishes to pay with their debit card.
Scenario: 1. Customer I/O: Signals to System that a credit payment is to be made, and the amount of this.	

2. System: Enables Card Reader.
3. Card Reader: Receives the card and associated personal identification number (PIN).
4. Card Reader: Requests verification of the PIN by the credit card.
5. Card Reader: If the PIN is verified, signals to the Bank that a credit card transaction is to be conducted, providing the appropriate card data, and the amount desired. Else <**PIN failure extension point>**.
6. Bank: If the amount is approved, places a hold on the amount against the available funds for the account associated with the card.
7. Bank: Signals the hold number to the System.
8. System: Signals to the Bank to complete the transaction, communicating the hold number.
9. Bank: Records the transaction, releasing the hold and reducing the available credit for the account associated to the card.
10. System: Reduces the remaining amount due by the amount of the transaction.
11. System: Signals to the Card Reader to release the card.
12. Card Reader: Indicates that the card should be removed.
13. Card Reader: Signals to the System that the operation is complete.
14. System: Signals to Customer I/O that the operation is complete and the remaining amount due is reduced.
15. Continue with super use case.

Exceptions:

1. If the Bank determines that the transaction should not be authorized, the system will be informed and it will not reduce the remaining amount due.
2. If communication with the Bank is faulty or interrupted, prior to the hold being authorized, the transaction will fail.
3. If communication with the Bank is faulty or interrupted after the hold being authorized, attempts to complete the transaction will be repeated every 20 seconds for 5 tries. If the transaction is not completed, the hold will be released and the remaining amount due will not change.

Priority:	High, must be implemented.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Card Reader, Bank.

Channels to secondary actors:
Card Reader: Hardwired.
Bank: Internet via secure protocol.

Open issues:

1. To minimize repetition, this UC is described generically, but there are three modes for the customer to interact with the Card Reader: Inserting, Tapping, and Swiping.
2. How does the hold get released if the Bank cannot be contacted?

Use case:	*Pay with Gift Card*
Primary actor:	Customer I/O
Goal in context:	To allow the customer to pay their bill with a gift card.
Preconditions:	The system is ready to receive customer payment.
Trigger:	The customer wishes to pay with a gift card.
Scenario:	

1. Customer I/O: Signals to System that a gift card payment is to be made, and the amount of this.
2. System: Enables Card Reader.
3. Card Reader: Receives the card.
4. Bank: If the amount is approved, places a hold on the amount against the available funds for the account associated with the card.
5. Bank: Signals the hold number to the System.
6. System: Signals to the Bank to complete the transaction, communicating the hold number.
7. Bank: Records the transaction, releasing the hold and reducing the available credit for the account associated to the card.
8. System: Reduces the remaining amount due by the amount of the transaction.
9. System: Signals to the Card Reader to release the card.
10. Card Reader: Indicates that the card should be removed.
11. Card Reader: Signals to the System that the operation is complete.
12. System: Signals to Customer I/O that the operation is complete and the remaining amount due is reduced.
13. Continue with super use case.

Exceptions:

1. If the Bank determines that the transaction should not be authorized, the system will be informed and it will not reduce the remaining amount due.
2. If communication with the Bank is faulty or interrupted, prior to the hold being authorized, the transaction will fail.
3. If communication with the Bank is faulty or interrupted after the hold being authorized, attempts to complete the transaction will be repeated every 20 seconds for 5 tries. If the transaction is not completed, the hold will be released and the remaining amount due will not change.

Priority:	High, must be implemented.
When available:	Second iteration.
Frequency of use:	Many times per day.
Channel to actor:	Hardwired.
Secondary actors:	Card Reader, Bank.

Channels to secondary actors:

Card Reader: Hardwired.

Bank: Internet via secure protocol.

Open issues:

1. How does the hold get released if the Bank cannot be contacted?

Use case:	*Repeated Bad PIN*
Primary actor:	Card Reader.
Goal in context:	To deal with repeated errors in PIN entry.
Preconditions:	The PIN has failed three times in a row for this card.
Trigger:	The customer has entered a PIN that failed verification for the third time in a row.

Scenario:

1. Card Reader: Signals to System that a third PIN in a row has failed, indicating the card data.
2. System: Signals to Bank that the indicated card should be blocked.
3. Continue with super use case.

Exceptions: 1. If communication with the Bank is faulty or interrupted, the communication of the block will be reattempted 10 times.	
Priority:	High, must be implemented.
When available:	First iteration.
Frequency of use:	A few times per day.
Channel to actor:	Hardwired.
Secondary actors:	Bank.
Channels to secondary actors: Card Reader: Hardwired. Bank: Internet via secure protocol.	
Open issues: 1. What happens if 10 repeated attempts to contact the Bank fail?	

Use case:	*Print Receipt*
Primary actor:	None.
Goal in context:	To provide a receipt for the purchases and payments made by the customer.
Preconditions:	Payment in full has been received for the customer's bill.
Trigger:	Payment in full has been received for the customer's bill.
Scenario: 1. System: The bill record will be updated with details of the payment(s). 2. System: Signals to the Receipt Printer to print the bill record. 3. Receipt Printer: Prints the receipt. 4. System: Signals to Customer I/O that the customer's session is complete. 5. Customer I/O: Thanks the Customer. 6. Customer I/O: Ready for a new customer session.	
Exceptions: 1. If the Receipt Printer runs out of paper or ink in the middle of printing the receipt, the printing will be aborted, the station will be suspended, and the attendant informed that a duplicate receipt must be printed and that the station needs maintenance.	
Priority:	High, must be implemented.
When available:	Second iteration.
Frequency of use:	Every customer transaction.
Channel to actor:	N/A.
Secondary actors:	Receipt Printer, Customer I/O, Attendant I/O.
Channels to secondary actors: Receipt Printer: Hardwired. Customer I/O: Hardwired. Attendant I/O: Local area network.	
Open issues: 1. Should electronic receipts also be supported? 2. If a problem occurs after payment is made, how can a duplicate receipt be created for the customer? 3. Can the customer decline printing a receipt?	

Use case:	*Low Ink*

Primary actor:	None.
Goal in context:	To inform the Attendant that a printer is low on ink, so they can correct the problem.
Preconditions:	The system is initialized.
Trigger:	A printer detects that its ink level has dropped below a specified threshold.
Scenario: 1. Receipt Printer: Signals to Attendant I/O that the ink level is low. 2. Attendant I/O: Signals to the Receipt Printer an acknowledgement. 3. System: If a current session is in progress, waits until it is complete. 4. System: Sets the status of the Customer I/O to "out of order", preventing new sessions. 5. Receipt Printer: When the ink has been refilled, signals to System and Attendant I/O that the problem is resolved. 6. System: Rests the status of the Customer I/O to "in order", permitting new sessions	
Exceptions: None.	
Priority:	High, must be implemented.
When available:	Second iteration.
Frequency of use:	Rare.
Channel to actor:	N/A.
Secondary actors:	Receipt Printer, Customer I/O, Attendant I/O.
Channels to secondary actors: Receipt Printer: Hardwired. Customer I/O: Hardwired. Attendant I/O: Local area network.	
Open issues: 1. Is it sufficient to check for ink level after the completion of each transaction? 2. How is the threshold specified? Is it set when the system is first installed, never to change?	

Use case:	*Low Paper*
Primary actor:	None.
Goal in context:	To inform the Attendant that a printer is low on paper, so they can correct the problem.
Preconditions:	The system is initialized.
Trigger:	A printer detects that its paper level has dropped below a specified threshold.
Scenario: 1. Receipt Printer: Signals to Attendant I/O that the paper level is low. 2. Attendant I/O: Signals to the Receipt Printer an acknowledgement. 3. System: If a current session is in progress, waits until it is complete. 4. System: Sets the status of the Customer I/O to "out of order", preventing new sessions. 5. Receipt Printer: When the paper has been refilled, signals to System and Attendant I/O that the problem is resolved. 6. System: Rests the status of the Customer I/O to "in order", permitting new sessions	
Exceptions: None.	
Priority:	High, must be implemented.
When available:	Second iteration.

Frequency of use:	Rare.
Channel to actor:	N/A.
Secondary actors:	Receipt Printer, Customer I/O, Attendant I/O.
Channels to secondary actors: Receipt Printer: Hardwired. Customer I/O: Hardwired. Attendant I/O: Local area network.	
Open issues: 1. Is it sufficient to check for ink level after the completion of each transaction? 2. How is the threshold specified? Is it set when the system is first installed, never to change?	

Use case:	*Adjust Coins for Change*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to alter the coins available for change.
Preconditions:	The system is initialized.
Trigger:	The level of coins available for change is below a threshold.
Scenario: 1. Cash I/O: Signals that the level of coins available is low to the System. 2. System: Signals to the Attendant I/O that the level of coins available is low. 3. System: When the session with the current Customer is complete, the relevant station is taken out of service. 4. Attendant I/O: When the coins have been refilled, the relevant session is placed back in service.	
Exceptions: 1. If insufficient change is available to complete the current transaction, the attendant should be signalled as to the change still due to the customer.	
Priority:	Low, as coins should be refilled before system initialization.
When available:	Third iteration.
Frequency of use:	Rare.
Channel to actor:	Local Area Network.
Secondary actors:	Cash I/O.
Channels to secondary actors: Cash I/O: Hardwired.	
Open issues: 1. How is the threshold specified? Is it set when the system is first installed, never to change?	

Use case:	*Adjust Banknotes for Change*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to alter the banknotes available for change.
Preconditions:	The system is initialized.
Trigger:	The level of banknotes available for change is below a threshold.
Scenario: 1. Cash I/O: Signals that the level of banknotes available is low to the System. 2. System: Signals to the Attendant I/O that the level of banknotes available is low.	

3. System: When the session with the current Customer is complete, the relevant station is taken out of service. 4. Attendant I/O: When the banknotes have been refilled, the relevant session is placed back in service.	
Exceptions: 1. If insufficient change is available to complete the current transaction, the attendant should be signalled as to the change still due to the customer.	
Priority:	Low, as banknotes should be refilled before system initialization.
When available:	Third iteration.
Frequency of use:	Rare.
Channel to actor:	Local Area Network.
Secondary actors:	Cash I/O.
Channels to secondary actors: Cash I/O: Hardwired.	
Open issues: 1. How is the threshold specified? Is it set when the system is first installed, never to change?	

Use case:	*Login*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to log in to the system.
Preconditions:	The system is initialized.
Trigger:	The Attendant, not being logged in, wishes to interact with the system.
Scenario: 1. Attendant I/O: Provides a user ID and password. 2. System: Permits the Attendant I/O to have access to the system.	
Exceptions: None.	
Priority:	High.
When available:	Third iteration.
Frequency of use:	A few times per day at shift changes, or when attendants go on break.
Channel to actor:	Local Area Network.
Secondary actors:	None.
Channels to secondary actors: N/A	
Open issues: None.	

Use case:	*Logout*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to log in to the system.
Preconditions:	The system is initialized.
Trigger:	The Attendant, being logged in currently, wishes to stop interacting with the system.
Scenario:	

1. Attendant I/O: Indicates the desire to log out. 2. System: Ends access to the system by the Attendant I/O.	
Exceptions: None.	
Priority:	High.
When available:	Third iteration.
Frequency of use:	A few times per day at shift changes, or when attendants go on break.
Channel to actor:	Local Area Network.
Secondary actors:	None.
Channels to secondary actors: N/A	
Open issues: None.	

Use case:	*Startup Station*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to start up a station.
Preconditions:	The system is initialized.
Trigger:	The Attendant decides to start up a station.
Scenario: 1. Attendant I/O: Indicates the desire to start up a particular self-checkout station. 2. System: Powers up the indicated station and starts its initialization; the indicated station starts in “not available” mode, so customers cannot interact with it.	
Exceptions: None.	
Priority:	High.
When available:	Third iteration.
Frequency of use:	Once per day when the store opens; rarely otherwise.
Channel to actor:	Local Area Network.
Secondary actors:	None.
Channels to secondary actors: N/A	
Open issues: None.	

Use case:	*Shutdown Station*
Primary actor:	Attendant I/O.
Goal in context:	To permit the Attendant to shut down a station.
Preconditions:	The system is initialized.
Trigger:	The Attendant decides to shut down a station.
Scenario: 1. Attendant I/O: Indicates the desire to shut down a particular self-checkout station. 2. System: Starts any teardown of the state for the indicated station. 3. System: Powers down the indicated station.	

Exceptions: 1. If a customer is in an active station, the Attendant I/O should be forced to confirm shutdown.	
Priority:	High.
When available:	Third iteration.
Frequency of use:	Once per day when the store closes; rarely otherwise.
Channel to actor:	Local Area Network.
Secondary actors:	None.
Channels to secondary actors: N/A	
Open issues: None.	