Mali Milk

group 3

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C: changelog

We added a new language option, the options are now: Dutch and English. This change is done to increase the amount of people that can use our service. We also added error handling, since we felt like this was not properly covered in our first assignment. Sorting was also added to our system. To improve convenience for the seller, he/she can now choose the sorting method with which the system will go through the order database.

0. Name

Mali Milk

1. Summary of key idea

The key idea is that customers and milk producers can both phone to a certain number, and access our service. Customers can place their order for milk. Their order consists of their address, the amount of milk they want to buy, and for what price they want to buy the milk. The milk producers can access all orders that are made at the time of calling, and can choose an order they want to fulfill. Once an order has been chosen by a milk producer, this order will not be available for other milk producers anymore to prevent double delivery. The NGO/cooperative/hosting org facilitates the service and the website where the order can be retrieved.

This service will tackle the problem that the milk producers in Mali are currently facing, which is poor communication between the parties involved. This leads to milk going to waste, and therefore the supply of milk going down. Since fluctuation of milk is a problem due to the changes in weather during the year, the supply is already an issue.

2. Actors and goals

Stakeholder	Operational goal	Responsibility in the envisaged system
Hosting organization (ICT business/NGO/Cooperative)	Provide the voice/web service	Making sure that the service works
Milk producer in small village	Find customers/communicate with resellers	Once accepted an order, the producer has the responsibility to deliver the right amount of (quality) milk (in a reasonable amount of time).

Customer/reseller	Easy placing orders by phone	Responsibility of buying the orders that they placed in order for the milk producer not to travel for nothing
Cooperative	Sell collectively at better price/improve milk value chain in the region for the small producers	Same as a customer/reseller. Has other responsibilities in the whole milk value chain but that is not related to the system

3. Context and scope (max 400 words)

3a. is covered in the uml use case diagrams which can be found at part 5 below.

3b. Part of the milk that is brought to the laiterie by a member of the cooperative is transformed to yoghurt. Improving the milk value chain is therefore affecting the yoghurt value chain as well. All the people that consume the milk (or a product that is made of the milk) that is bought by the resellers.

3c. Our scenario covers the creation of orders done by the customers/resellers, and the (digitally) fulfilling orders by the milk producers. Whether or not the milk producer truly delivers the product falls outside our scope. Also our system does not guarantee that the customer/reseller is buying the order once the milk producer arrives at the given address, and neither does our system guarantee that the milk producer delivers the right quality/quantity. Payment of the order is also outside our scope. As of now, error handling is not covered in our system. If mistakes are made, or a user wants to go a step back for a certain reason, the user has to end the conversation and call the service again.

3d. Some example performance measures are: amount of milk sold, price of the milk, and quality of the milk. The problem we are trying to solve is the communication between the milk producers and the customers. This communication was proven to be difficult, and since milk is such a perishable product, communication is key since the product has to be sold/consumed rather fast. People used to collect the milk from the cattle and sell it along the road, but this was not profitable. Improved communication would lead to more milk sold, because if the communication is better, less milk would go to waste and therefore more milk would be sold, therefore the amount of milk sold is one performance measure. If less milk would go to waste, the price for milk could go down, since the milk producer is now selling more for the same milk that is collected from the cattle. Also, good communication would lead to a fast delivery of milk with the milk being fresher than if it is delivered at a later time, therefore quality of milk can also be considered a performance measure.

3e. One precondition is that either the milk producer or the customer/reseller has a way of transport. This means that there is an infrastructure that supports the journey, and that one has a travel method (might even be walking). If neither one can travel to the other, the order can not be completed since the milk can not be delivered or collected. Another precondition is that both parties are able to communicate well enough to as a customer place an order or as a milk producer to understand the orders that are already made. The last precondition is that both parties have a way of accessing the service. If not enough people can access the service, the effectiveness of the service would decrease.

4. Use case scenario script (make a conceptual model or storyboard)

step 1, system: ‘Hello, welcome to mali milk’ explain what is going to happen in the conversation and what this service is because the user can not see what the app wants them to do. ‘*in language 1* choose 1 for language 1, *in language 2* choose 2 for language 2.

step 2, caller: presses 1 or 2

step 3, system: you chose 1 / 2 (system continues the whole conversation in the chosen language). Are you a seller or a buyer?

step 4, caller: confirmation whether the caller is a seller or a buyer, possible through voice, or through a button press (1 for buyer, 2 for seller for example).

if buyer:

step 5, system: you chose buyer, please state your order mentioning price, liters, and the delivery address, and the latest date you want the milk delivered.

step 6, caller: say the order

step 7, system: repeat the order because the users can not see what the system thought they did, and ask if it is ok: 1 if ok, 2 if not

step 8, caller: press 1 or 2

if 1:

step 7a, system: repeat the whole order and end call

step 8, system: insert order in database

if 2:

step 7b, system: repeat from step 5

if seller:

step 5, system: you have chosen seller, ask the caller in what order he/she would like to hear the orders: sorted on price/amount.

step 6, caller: choose the sort method

step 7, system: provide the messages (sorted) of the orders with numbers attached to them, ask the seller which one he wants to fulfill.

step 8, caller: press the number of the order that he/she wants to fulfill.

step 9, system: repeat the order that belongs to that number and ask if that is the right one, press 1 if so press 2 if not.

if 2:

step 10a, system: repeat from step 5

if 1:

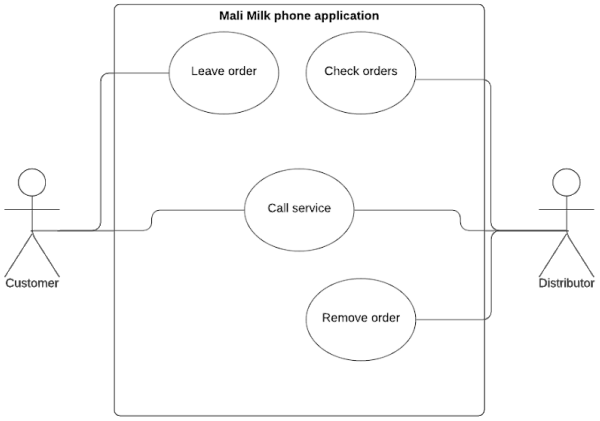
step 10b, system: repeat the order and end call.

step 11, system: remove order from (available) database

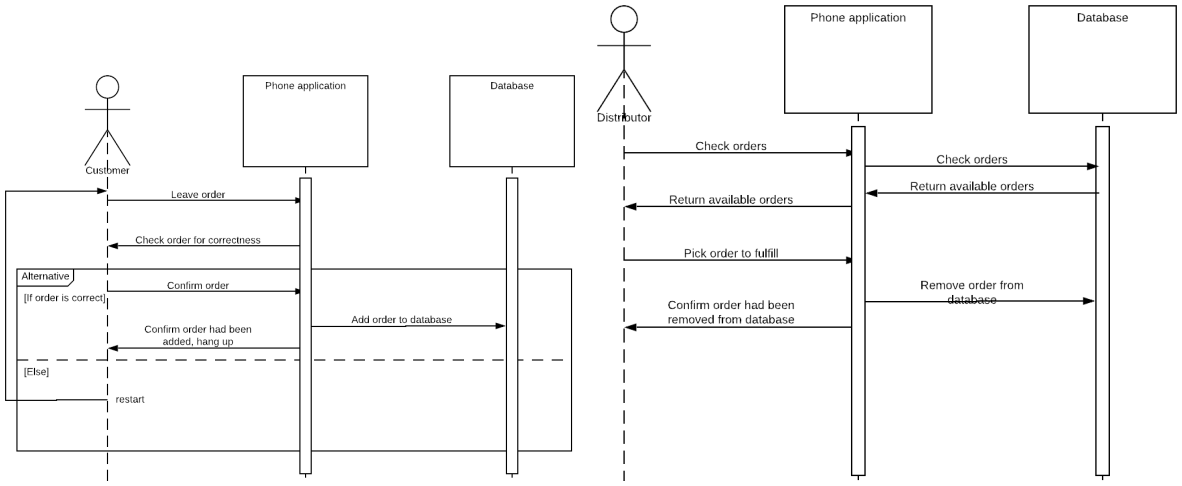
See a visualization of the use case in the appendix.

5. Interaction and communication (max. 100 words)

The two use-cases, visualised above in section 4 as a storyboard, are visualised here in the form of a UML use case diagram.



In order to make the specific actions for each agent clear, one can look at the following UML sequence diagrams, for the customer and for the distributor:



Voice service prototype

A prototype of the voice service is developed, implementing part of the interface that will be used in the final product. All user input is implemented as key presses using dtmf tones. The application contains separate menus and forms for the customer and producer. In the customer form, the number of liters of milk is entered using keypresses, and the value stored in the number field is read back as a confirmation. The producer part of the interface currently reads back a pre-recorded example of a possible order list, using the `<audio>` tag. Since most languages spoken in Mali (e.g. Bambara) are not available as a text-to-speech implementation, similar audio fragments will be used in the final product to implement prompts in different languages.

7. Technology infrastructure

For our full application to work we have to deploy it on a resource that can handle the different techniques we intend to use. The user needs to be able to have a working microphone to be able to communicate his address, and at the same time, our system needs to be able to process this message. Other things that the user needs to be able to use our service are: a working speaker (to listen to the service), a working keypad on the phone he/she is calling the service on, and a suitable connection to be able to connect to the service. Kasadaka enables us to use voice recording, and it also enables us to use keypad as an input for the user.

13. Pointer to how to access the application

To access the functional prototype, simply point your VoiceXML browser to:
http://fierce-eyrie-57424.herokuapp.com/vxml/start/2.

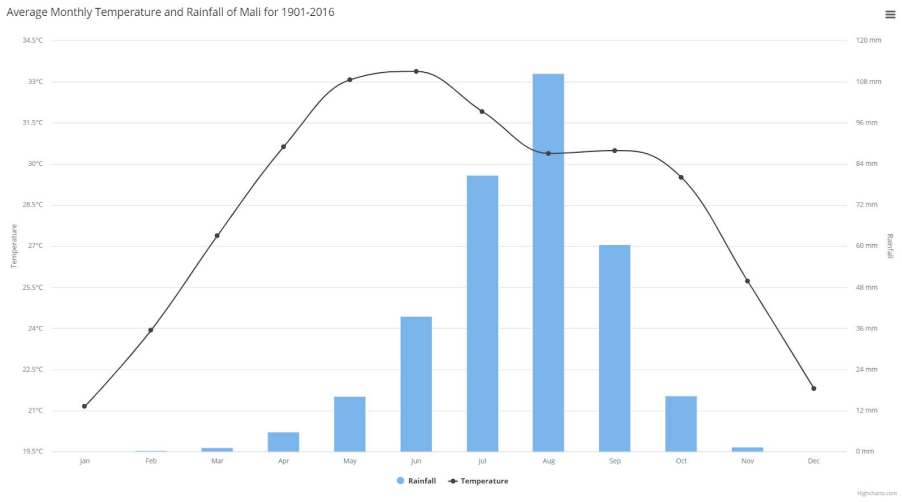
The prototype implements the voice service described as above, as far as possible using the existing VSDK without custom extensions. The main limitation of the prototype is that the amount, price, and expiration date can not be entered, since this requires more elaborate DTMF functionality. For this reason, the number inputs are simulated using a “choice” element; please always choose “1” to go to the next option. Error handling and sorting are also not yet part of the prototype. If the “seller” option is chosen, a dummy order list containing a single order is presented.

With the above limitations in mind, we believe the currently implemented prototype gives an accurate idea of how the final service will work for milk buyers and sellers, using multiple languages and allowing to input the address by voice.

14. Assignment 3 theoretical investigation

Potential:

Results of a study [1] show that there is room for expansion of West African cattle if cows are supplemented and stall-fed during the dry season. The dry season (shown in the figure below) is currently an issue for the milk industry because milk supply is low, and milk storage is not efficient because of cooling. The same study [1] hints that farmers may even replace cotton (which is currently seen as ‘white gold’) for milk if marketing infrastructure and milk markets are further developed. Another study [2] investigated the potential of video usage on mobile phones and found that it has a lot of potential for farmer-to-farmer exchange. While our case does not revolve around farmer-to-farmer exchange, but rather farmer-to-customer (through our service) and vice versa, this potential might also translate to our case.



data: world bank

Expected problems:

One problem regarding milk production in West Africa is that of calf survival. There are different management strategies regarding herd managing. One study [3] investigated the relation between these strategies and calf survival rates. The results showed that the modern strategies (which are currently required for an increased herd size) had the highest calf mortality rates. Milk production of cows however depend on this calf survival because cows often need the stimulus of their suckling calf for milk letdown.

Another problem that arises with the switch to a modern system is hygiene. A study [4] showed that one third of the milk at the market was positive to a alcohol test and 8.6% was adulterated. The hygiëne in a (semi)modern system was found worse than that of a traditional system. However in that system, milk was boiled before selling, but milk was re-contaminated due to the poor hygiene of the containers which were used during cooling and marketing.

Costs:

As for costs, besides the production and deployment costs, infrastructure costs should also be considered. The system could be perfect but if infrastructure does not allow for delivery of the milk, the system is worthless. Data from the world bank can be found below. Mali is the 176th most densely populated country in the world and therefore, good infrastructure (or a solution to the travelling) is needed because travel distance is likely high. While the numbers show that Mali is not on par with other low income countries in multiple metrics, the percentage of firms identifying roads as major business constraint is lower than that of the low income countries, and almost as low as middle income countries, which means that infrastructure costs should not be too drastic.

Combatting the problems that occur with the transition to a modern system however might be expensive. These problems are described in the problem section above. These problems are not easily solvable and might require drastic changes.

	Unit	Low-income countries	**Mali**	Middle-income countries
Classified road density	km/1000 km^2 of arable land	132.1	**38.3**	318.4
Classified road density	km/1000 km^2 of land	88.2	**27.9**	278.4
Rural accessibility Index-HH Survey	% of rural population within 2km of all-season road	34.1	**14.0**	62.7
GIS rural accessibility	% of rural population within 2km of all-season road	23.1	**16.7**	31.5
Paved road traffic	Average annual daily traffic	1341.1	**547.5**	3797.7
Unpaved road traffic	Average annual daily traffic	38.5	**21.5**	74.7
Paved network condition	% in good or fair condition	86.2	**64.8**	82.0
Unpaved network condition	% in good or fair condition	55.8	—	57.6
Perceived transport quality	% firms identifying roads as major business constraint	27.6	**20.1**	18.2
Overengineering	% of main road network paved relatively to low traffic	29.6	**47.7**	18.4

Source: Gwillliam and others 2009.
Derived from AICD national database downloadable from http://www.infrastructureafrica.org/aicd/tools/data

Testing

Due to time management issues we did not manage to do any testing (and improve our system based on the results). We were planning on asking a group of 20 to try to do different things with our system (to place an order for example) and to report on different features afterwards. Most optimal would be to get (West African) farmers to test out system but due to the current circumstances this is ofcourse not possible.

Bibliography

[1] de Ridder, N., Sanogo, O., Rufino, M., van Keulen, H. and Giller, K., 2015. Milk: the new white gold? Milk production options for smallholder farmers in Southern Mali. *Animal*, 9(7), pp.1221-1229.

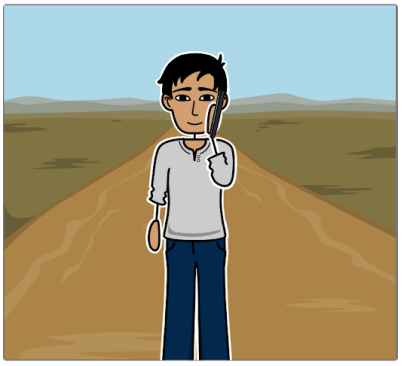
[2] Sousa, S., Gian, N., Home, Robert., 2016. Information Technologies as a Tool for Agricultural Extension and Farmer-to-Farmer Exchange: Mobile-Phone Video Use in Mali and Burkina Faso. *International Journal of Education and Development using Information and Communication Technology.*

[3] Wymann, M., Bonfoh, B., Schelling, E., Bengaly, S., Tembely, S., Tanner, M. and Zinsstag, J., 2006. Calf mortality rate and causes of death under different herd management systems in peri-urban Bamako, Mali. *Livestock Science*, 100(2-3), pp.169-178.

[4] Bonfoh, B., Wasem, A., Traoré, A., Fané, A., Spillmann, H., Simbé, C., Alfaroukh, I., Nicolet, J., Farah, Z. and Zinsstag, J., 2003. Microbiological quality of cows' milk taken at different intervals from the udder to the selling point in Bamako (Mali). *Food Control*, 14(7), pp.495-500.

Appendix

Start of interaction

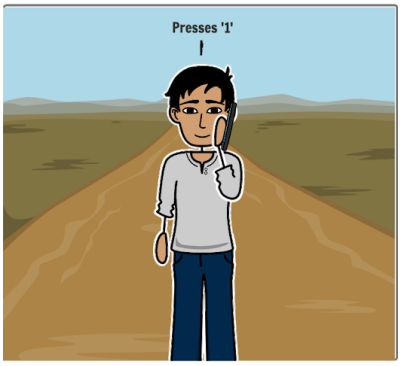


Customer calls the Mali Milk service

Menu - choose language

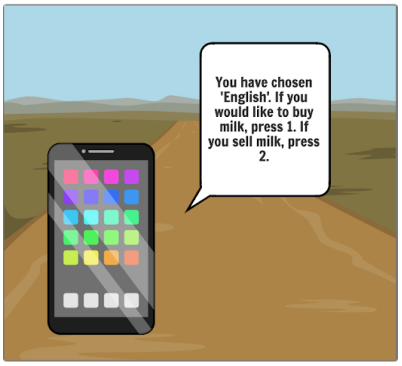
Recorded welcome message is played. User is given the choice to access the application in different languages.

Choose language



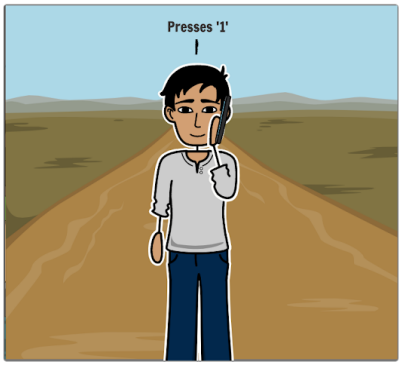
Customer presses 1, indicating he wants to access the English version of the application

Menu - choose buyer or seller



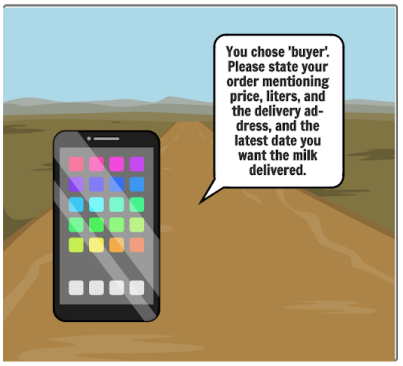
The system confirms the language choice, and asks the user if he is a buyer or a seller.

Choose buyer



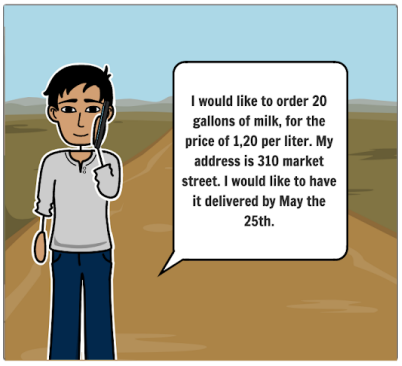
Customer presses 1, indicating he wants to buy milk.

Menu - ask for order details



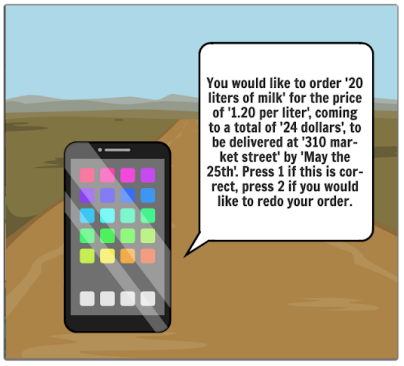
The system confirms the choice of 'buyer', and asks the user for the order details.

Give order details



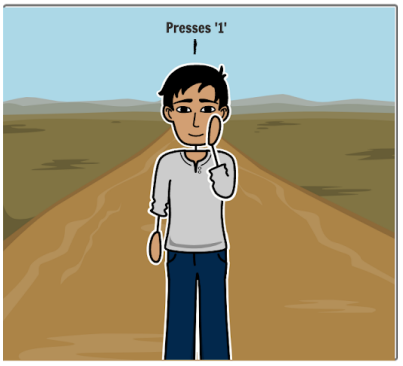
The customer gives the order details, stating the amount, price, delivery address, and latest delivery date.

Menu - Confirm order



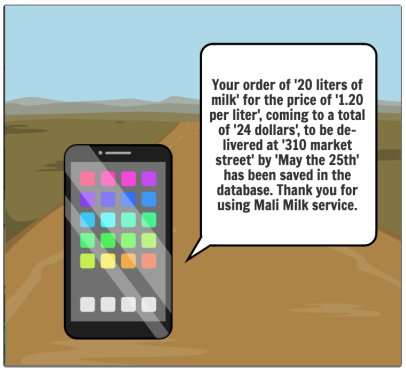
The system plays the order back, and asks the user to confirm it.

User - Confirm order



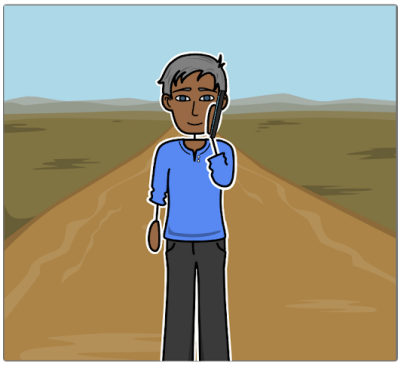
The Customer presses '1', indicating the order is correct.

Menu - Confirm order



The system plays the order back once more and confirms it has been saved in the database. The system then terminates the call.

Start of interaction

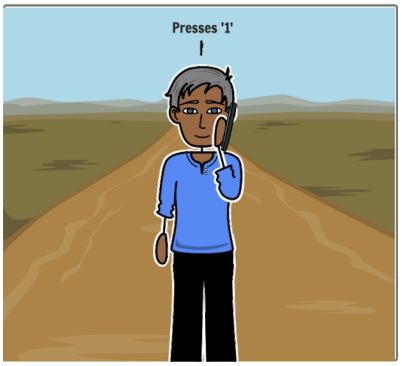


Distributor calls the Mali Milk service

Menu - choose language

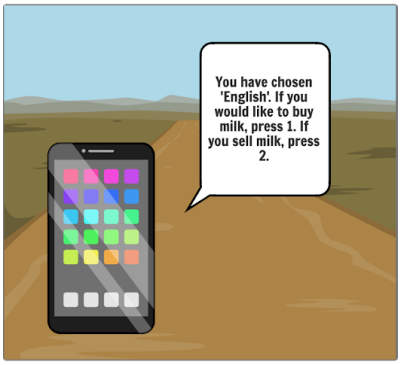
Recorded welcome message is played. User is given the choice to access the application in different languages.

Choose language



Distributor presses 1, indicating he wants to access the English version of the application

Menu - choose buyer or seller

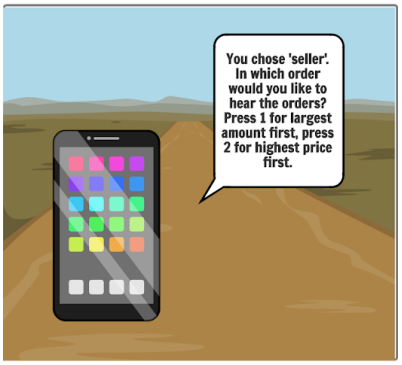


The system confirms the language choice, and asks the user if he is a buyer or a seller.

Choose seller

Distributor presses 2, indicating he wants to sell milk.

Menu - ask for order details

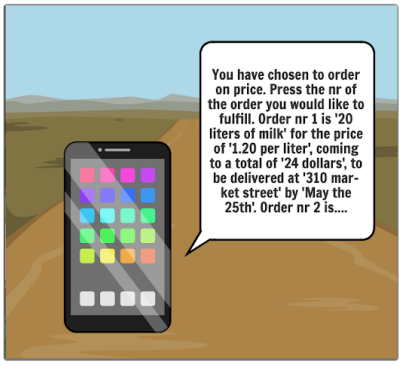


The system confirms the choice of 'seller', and asks the user for the preferred ordering.

Choose 'price' order

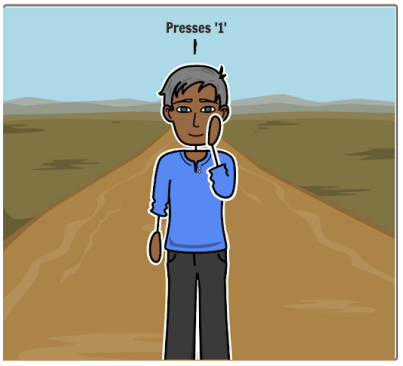
Distributor presses 2, indicating he would like the orders ordered on price.

Show orders



The system confirms the ordering preference, and shows the orders to the distributor.

Pick order

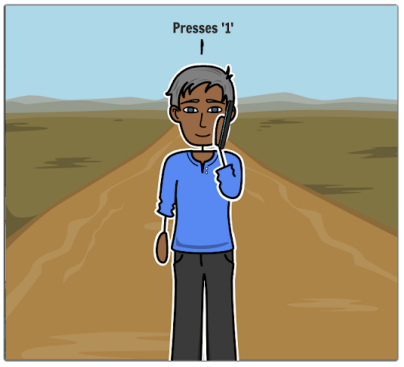


The Distributor picks the order he wants to fulfill by pressing the corresponding nr, '1'.

Menu - check order

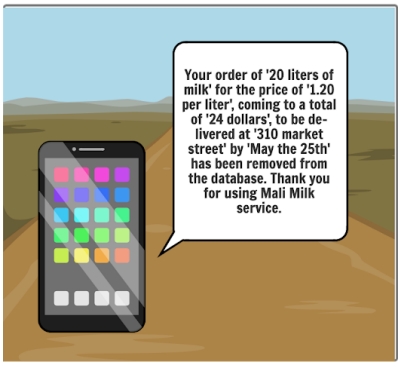
The system plays the order back, and asks the user to confirm.

User - Confirm order



The distributor confirms that he wants to fulfill that order by pressing 1.

Menu - confirm order



The system plays the order back once more and confirms it has been removed from the database. The system then terminates the call.