VEGETABLE VENDING MACHINE
PRODUCT DESIGN PROJECT III

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Vegetable vending machine

Industrial Design Project III

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Approval

The project titled "Vegetable vending machine" by Hargude Akshay Narayan [136130007] is approved for the partial fulfillment of the requirement for the degree of Master of Design in Industrial Design.

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Declaration

I hereby declare that this written submission represents my idea in my own words and where others' ideas have been included; it has been adequately cited and referenced the original source. I declare that I have adhered to all principles of academic honesty and integrity and have not misinterpreted or fabricated or falsified any data/ idea/ facts/ sources in my submission. I understand that any violation of the above entitles the institute to take disciplinary action against me to which I shall be answerable.

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Abstract

India is Second Largest Producer & consumer of Vegetables in the world.[1] With the increase of IT sector in India and the tight schedule of offices, people are finding it difficult to go to market and buy vegetables everyday. Also, people are becoming more health-conscious in terms of quality of vegetables they consume.

The farmers in India work hard; but still they don't get enough money in return; because the vegetables which they produce come to end customer through a long middle men chain. Because of this, farmers are not paid the adequate price compared to the price paid by end customer for the same vegetable.

With this project, I have tried to solve the problems of both farmers and customers by reducing middle men chain and by providing fresh & nutritious vegetables to customer at their door steps.

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Introduction

First vending machine was developed by Hero in 1st century, AD. He was an engineer, physicist and mathematician. This machine used to accept coins and dispense holy water in the temple of Alexandria, Egypt. Coin operated tobacco dispensing machine was being used in 1615 in the taverns of England. In 1822, English bookseller Richard Carlie created a vending machine that would dispense reading material censored by authorities. After 1950s vending machines were created to dispense various products like cigarette, Coffee, Cola, Candy etc. [2]

Vending machines are not very common in India and are usually found only in major cities. Seaga Group of USA, is the pioneer for bringing the concept of vending machines to India.

Several reasons have been attributed to the lack of success of vending machines in India. The availability of cheap labour makes operating stores economical. Customers with lack of technical knowledge feel uneasy while using vending machines.

However, vending machines are relatively new in India and analysts believe that their usage will rise.

Why Vegetable vending machine ?

With the increase of demand of vegetables, farmers started using chemical fertilizers, pesticides and insecticides to get more crop production. But these pesticides are not good for human health. Now a days people are becoming more conscious about the food they eat. They prefer to have fresh and nutritious food everyday.
In India 60% of food quality gets lost in the supply chain from farmer to end customer [3]
With the introduction of IT sector in India, life of people has become hectic with tight schedule. As the market places are quite away from residential areas, people cannot find time to go to market and buy fresh vegetables everyday. Hence, they want some source to get fresh vegetables everyday at a convenient distance..

Indian farmer works very hard, but still he doesn't get enough money in return. The main reason behind it is the long middlemen chain through which vegetables come from farmer to end customer. It causes remarkable increase in price of vegetables.

Hence, by designing a new system of vegetable farming and marketing as well as with the introduction of Vegetable vending machine, this middlemen chain can be eliminated. Farmers will get more money for the same vegetable and the customers will get fresh and nutritious vegetables at comparatively lower price.

Secondary research

Current scenario

Farmers:
In India 60% of food quality gets lost in the supply chain from farmer to end customer. The farmer in India gets around 30% of what the consumers pay at the retail store. Compare this with the situation in USA, where farmers can receive up to 70% of the final retail price and wastage levels are as low as 4 to 6 %. [3]
Hence, in India the financial condition of farmers can be improved by eliminating the middle men chain and minimizing wastage of vegetables.

Customers:
Price of the vegetables go on increasing with the entry of every middle man in supply chain. Consumers actually end up paying approximately 35% more than what they could be paying if the supply chain was improved because of wastage as well as multiple margins in the current supply structure. [3]
Now a days, people have become more health conscious about the quality and nutritious value of food they eat. People prefer to buy fresh food every day.
But with the introduction of IT sector in India, people find it quite difficult to go to market everyday for fresh & nutritious food. Also the market place is far away from the residential area, so its not convenient for customer. Also the quality, quantity and nutritious value of vegetables is not guaranteed.

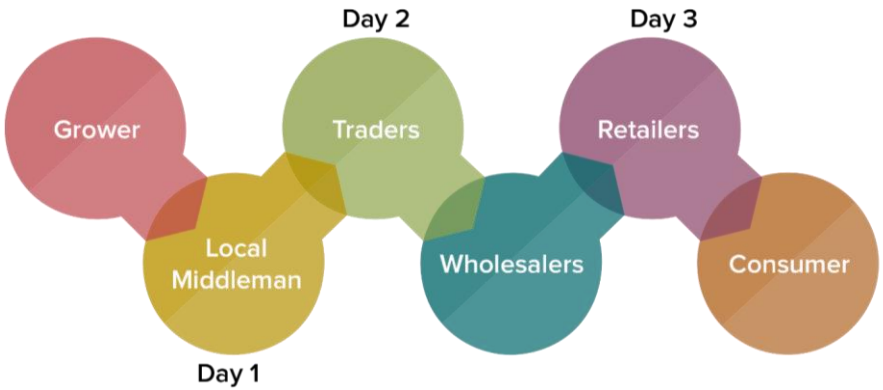


Fig.1: Traditional supply chain

Traditional vegetable supply chain

Following is a simple schematic diagram of the vegetable supply chain in India. Refer Fig.1. It shows the minimum number of intermediaries who are involved in the traditional supply chain of vegetables in India.
In India, the majority of the trade happens through traditional path. Generally the growers sell vegetables to the local middle man who collects vegetables from several adjacent areas and sells to the commission agent and trader. The commission agents are the middle men who find out buyers for the local middle man and take some commission against the sales made. They generally find the bigger players or traders who buy vegetables in large quantity. Then the vegetables get distributed through retailers to consumers.

The main problem in this supply chain is that the transaction cost is too high due to more number of intermediaries in the value chain. Only 30 – 35 % of the end price reaches to the growers and other part goes to different intermediaries.

Factors affecting the vegetable supply chain

Availability of cold storage
Cold chain is a logistic system that provides a series of facilities for maintaining ideal storage conditions for perishables from the point of origin to the point of consumption.

Government policies
Food and agriculture are important national activities and affect the well being of its population of every country.

Connectivity
Connectivity is a major issue in India and it is playing a vital role in supply chain inefficiency. Many villages are not connected with proper roads; so, transferring goods from these locations is a real challenge.

Sorting & grading technology
In India, in most of the cases the sorting is done by the farmers itself and they have very less knowledge about the grading techniques and processes.

Handling & Packaging
Proper handling and packaging facilities are not available in all locations and this is the reason lots of vegetables are wasted and the quality is also deteriorated.

Skilled labor
Properly skilled labor is not available for sorting, grading and packaging.

Poor linkage in the marketing channel
Information flow in the marketing channel partners don't happen properly and thus demand – supply gap is huge.

Standards
No scientific standards are followed for determination of maturity and quality of the vegetables. Some times the harvesting is done before maturity because of sudden market demand, specifically at the time of festivals.

Handling
Harvested vegetables are collected on the ground under shade or even without shade. Rough and unhygienic handling of vegetables is done while carrying it to the market. This results into low market price and low storage life.

Primary research

Field study [Farmers]

Fig.2: Farmers interviewed

Name- Mr. Kailas Jadhav
Age- 67 years
Place- Kesnand, Pune

Name- Mr. Varad Kakade
Age- 36 years
Place- Wagholi, Pune

I Belong to a farmer's family. Right from my childhood I am aware about all the sides of farming practice. I have observed that Indian farmers loose major part of their revenue in traditional supply chain only. Also because of uncertainty about the market prices they are not assure about the revenue they get from the goods they produce.

Around 15 farmers of my village were interviewed (Refer Fig.2). Questions were asked to them about the vegetables they grow, the type fertilizers & pesticides they use and the difficulties they face during selling their goods in the market.
Also central vegetable market of Pune (Market yard) was visited. Questions were asked to the middle men & their business strategy was understood.

Insights

- Now a days most of the farmers use chemical fertilizers for their vegetables. As they are not aware about the long term side-effects of chemical fertilizers, and as they want instant results, they prefer to use chemical fertilizers rather than organic one.
- Also they extensively use pesticides & insecticides as an remedial & precautionary solution to protect their vegetables.
- Small farmers sell their goods In the local market only. Because of less vegetables, lack of transportation facility and lack of knowledge, they avoid to go to central big market. Eventually they get comparatively lower price.
- Big farmers go to central big market place to sell their goods. But because of the less knowledge about the overall production of the same vegetable in that region, sometimes they get very less price due to large production of that vegetable by other farmers.
- The price they get in the market is totally uncertain with a risk of Zero profit.
- Also because of lack of proper storage system, sometimes they have to suffer by quality loss of vegetables; eventually getting lesser price in the market.
- The margin of the primary middle man varies from 5% to 20%

Field study [Customers]

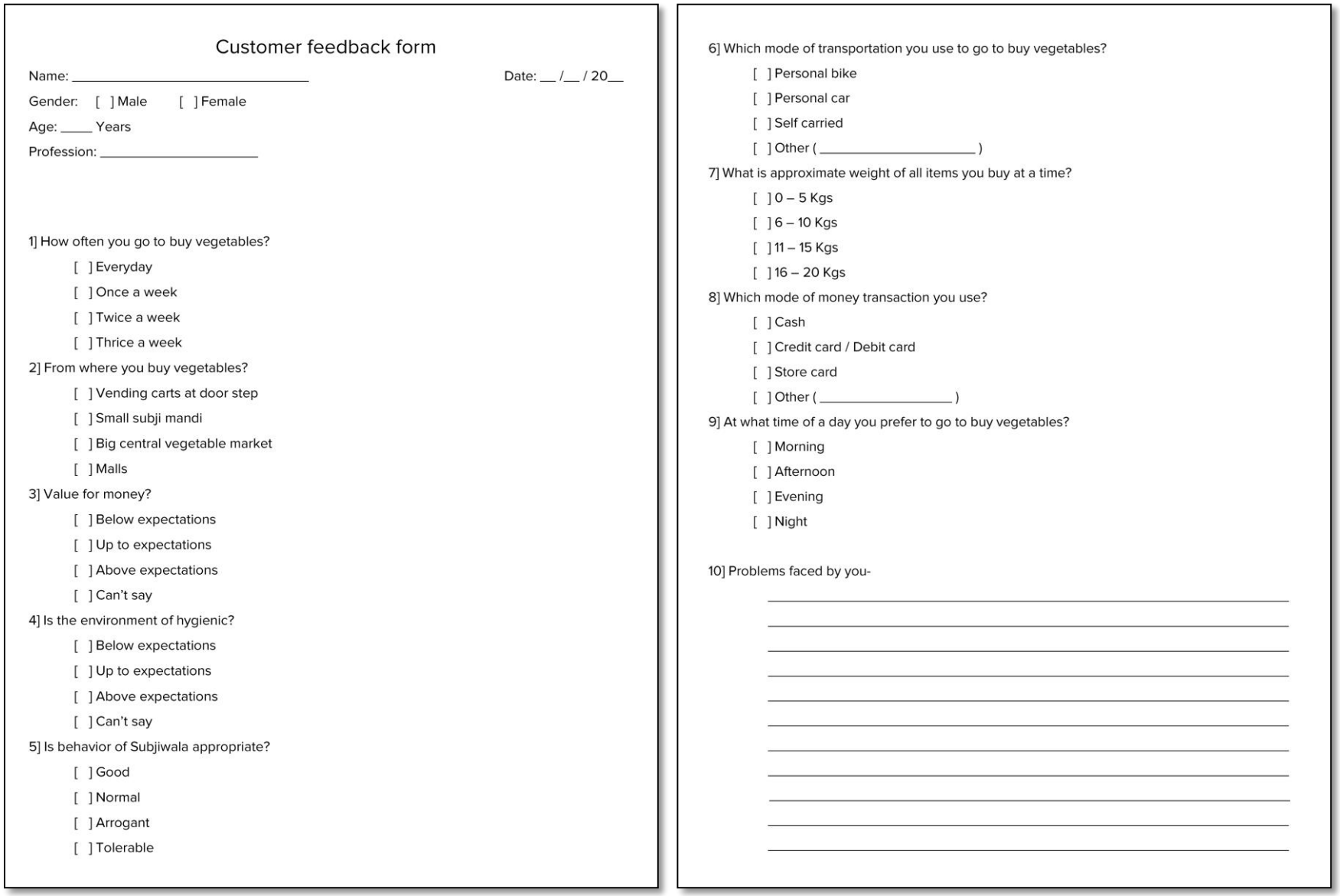
Fig.3: Local vegetable market, Pune

Central vegetable market, Local Vegetable markets (Refer Fig.3), and Vegetable shopping malls like Haiko, Reliance fresh and Spencer's were visited.

Traders, Road-side vendors, Shopkeepers, Vendors with Vending carts, Costumers of different gender, age group, and profession which include Bachelor guys, Married couples, Retired people & Children of age 8 to 14 years were interviewed.

A questionnaire of 10 questions about vegetable buying activity from customer point of view was made (Refer Fig.4). From this questionnaire, the problems which are being faced buy customers and their expectations about the vegetable buying activity was understood.

From these insights, the Design statement and Design brief was defined.



Customer feedback form

Name: _____ Date: __ /__ / 20__

Gender: [ ] Male [ ] Female

Age: ____ Years

Profession: _____

1] How often you go to buy vegetables?

[ ] Everyday
[ ] Once a week
[ ] Twice a week
[ ] Thrice a week

2] From where you buy vegetables?

[ ] Vending carts at door step
[ ] Small subji mandi
[ ] Big central vegetable market
[ ] Malls

3] Value for money?

[ ] Below expectations
[ ] Up to expectations
[ ] Above expectations
[ ] Can't say

4] Is the environment of hygienic?

[ ] Below expectations
[ ] Up to expectations
[ ] Above expectations
[ ] Can't say

5] Is behavior of Subjiwala appropriate?

[ ] Good
[ ] Normal
[ ] Arrogant
[ ] Tolerable

6] Which mode of transportation you use to go to buy vegetables?

[ ] Personal bike
[ ] Personal car
[ ] Self carried
[ ] Other (_____)

7] What is approximate weight of all items you buy at a time?

[ ] 0 – 5 Kgs
[ ] 6 – 10 Kgs
[ ] 11 – 15 Kgs
[ ] 16 – 20 Kgs

8] Which mode of money transaction you use?

[ ] Cash
[ ] Credit card / Debit card
[ ] Store card
[ ] Other (_____)

9] At what time of a day you prefer to go to buy vegetables?

[ ] Morning
[ ] Afternoon
[ ] Evening
[ ] Night

10] Problems faced by you-

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Fig.4: Customer feedback form

Insights

Following insights were taken from the feedback form

- House wives & elderly people go & buy vegetables everyday or thrice a week.
- People prefer to buy vegetables from nearby market.
- Most of the people find local market places quite unhygienic.
- Many times they have to face arrogance of subjiwala. Mostly while selecting vegetables & money exchange.
- They find it quite inconvenient to go and buy vegetables from local market due to heavy traffic. If they take a walk, then it becomes difficult to carry heavy bags from market to home.
- Unavailability of carry bag becomes a big problem. Most of the time, wife calls his husband and asks him to buy vegetables in the evening while coming home & most common answer given buy husband is “I don’t have carry bag”.
- Sometimes, the bags become quite heavy due to more vegetables. Then it becomes difficult to carry it home. Mostly for elderly people this is a big problem.
- The vegetable prices range from 5 rupees to 30 rupees. So it becomes a big problem in money exchange. Most common currency note available with people is ‘Rupees 10’. So, it becomes difficult when total becomes other than multiple of 5.

Insights

- Most of the local vegetable markets open at 7 in the morning and close at around 10 in the morning. Again they open at 6 in the evening and close at 10 in the night. So it becomes difficult to find vegetable at the time other than market timing.
- People find it difficult to find some particular vegetable. Sometimes, they have to search entire market.
- People don't have enough trust on local vendors. Hence they prefer to check some vegetables by destruction analysis technique. E.g. they break bhendi to check its freshness & quality. But most of the vendors don't allow it. As it causes their loss.
- Sometimes, if only one vendor is having some particular vegetable in the entire market, then he/she raises the price of that vegetable.
- People find it very difficult to buy vegetables in rainy season. In rainy season, quality of vegetables deteriorate due to constant water contact. Also, it become difficult to go to the market for buying vegetables.

Insights

- People do not have assurance about the quality of vegetable they buy.
- People never get assurance about the weight of the vegetable they buy.
- Because of multiple handling in the traditional supply chain the quality of vegetables reduces.
- People from Middle class & upper middle class societies are quite unsatisfied with current system ; as they are more health conscious.
- People are quite satisfied with the vegetables they get from big shopping malls. People do have trust about the vegetables they get from such shopping malls. Sometimes, they directly lift the packaged vegetable without carefully inspecting it.
- But its not at all convenient for them to go to malls everyday just to buy vegetables. It takes time.
- Also they have to pay extra price in malls due to its brand value.

Design Brief

Design statement

To design a vegetable vending machine for Indian middle class & upper middle class society

Following important features should be incorporated in the vegetable vending machine

1] Usability –

- Clear visibility of entire range of vegetables
- Easy to use for customers as well as service person
- Easy to use and fresh interface
- 24 x 7 service
- Clear indication of price & weight of each vegetable
- Payment options- Credit card, Debit card and Store value card

2] Appeal-

- Slightly futuristic & fresh design
- Enough space for branding

3] Mechanism-

- Sensors to sense available vegetables on rack
- Provide carry bag on demand
- Mechanism to dispense vegetables packaged in to rectangular boxes.

4] Safety-

- CCTV cameras should be integrated in the design

How will it work ?

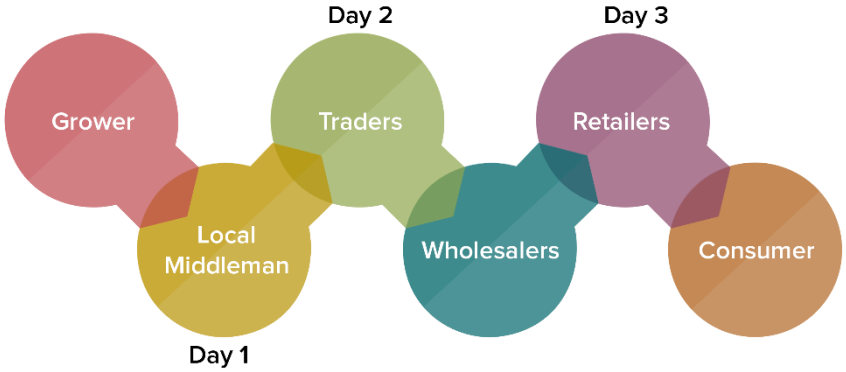


Fig.5: Traditional supply chain

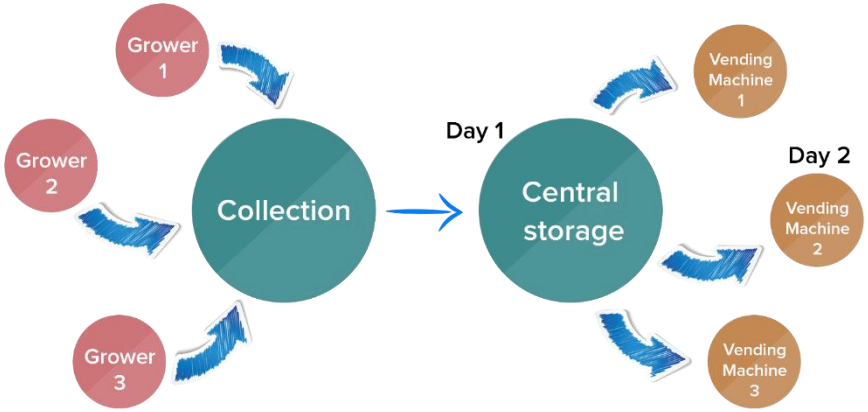


Fig.6: New supply chain

The company will provide farmers statistical data about which vegetable to grow in coming season so that they will get good price to the vegetable. Company will make a bond with farmers and ask them to use organic fertilizers only (Company will also provide farmers organic fertilizers at comparatively lower price). After harvesting, the company vehicle will transport it to the central storage unit.

In traditional supply chain, the vegetables travel from grower to local middleman then to traders- wholesalers- Retailers and then finally to Customer. This is very long chain which takes approximately 3 days. As shown in Fig. 5. In these 3 days, the quality of vegetables reduces and also due to margins of middlemen, the price increases.

In new system, middle men will be almost eliminated ; by which fresh vegetables will be made available to customer at lower price. As shown in Fig. 6. In new system, the vegetables will be collected from all the local farmers & it will be transported to a central storage unit on the very same day. Then according to the requirement it will be supplied to the respective vending machines in different areas.

Hence in this new supply system, The number of middle men is reduced which reduces the margins / commission of middle men. Also, as the vegetables are being delivered on the same day or sometimes on next day, it will help to keep them fresh & nutritious for longer time.

Parallel product study

Fig.7: Coffee vending machine

http://n3.sdlcdn.com/imgs/a/h/8/Cafe-Desire-Coffee-Tea-Vending-SDL765171084-1-46cba.jpg as on 1st Feb, 2015

Fig.8: Cold food vending machine

http://i.huffpost.com/gadgets/slideshows/359769/slide_359769_4016170_free.jpg as on 1st Feb, 2015

Fig.9: Snack vending machine

http://oldguyhockey.com/wp-content/uploads/2012/05/AMS_Snack.jpg as on 1st Feb, 2014

Fig.10: Soft drinks vending machine

http://letstalkpayments.com/wp-content/uploads/2013/09/Vending-machine.jpg as on 1st Feb, 2014

Roughly vending machines can be classified in five different types.

1. Coffee vending machine
2. Cold food vending machine
3. Snack vending machine
4. Soft drinks vending machine
5. Non perishable product vending machine

Coffee vending machine

This type of vending machines are primarily designed for office use only. They occupy very small space. Its primary inputs are coffee powder, milk powder, sugar and water. It consists of a heating coil, a stirrer, & mixing chamber. Sometimes the same machine can also make tea. Refer Fig.7.

Cold food vending machine

This type of vending machines sell items like salads, sandwiches, breakfast items, or meals. These items are mostly precooked. Ref. Fig.8.

Snack vending machine

Snack vending machines are designed for corporate offices, shopping malls and theatres. They mostly serve candy bars, chocolates, chips, cookies, pastries, etc. Ref. Fig.9.

Soft drinks vending machine

This type of vending machines are quite popular in western countries. It vends both soft drinks and water. It is designed such that it can vend soft drinks packaged both in cans and bottles. Refer Fig.10.

Fig.11: Stilettoes vending machine

https://fixturescloseup.files.wordpress.com/2012/10/fashion-shoe-vending-machine.jpg as on 1st Feb, 2014

Fig.12: Vegetable vending machine

https://fixturescloseup.files.wordpress.com/2012/10/fashion-shoe-vending-machine.jpg as on 1st Feb, 2014

Non perishable products vending machine

Now a days, many venders are using vending machines to sell non perishable products like shoes, cigarette, iphone, gold, etc. Refer fig.11.

Vegetable vending machine

As vegetables are perishable in nature, and as their shelf life is very less, there are very less number of vegetable vending machines are available in the market. Most of them are similar to locker system with one piece of vegetable in one compartment with a coin accepter lock outside. Refer Fig.12.

Fig.13: Vegetable vending machine

http://3.bp.blogspot.com/-C-Vny04s-Vs/T_foexvcVbI/AAAAAAAAXVw/0jd-TPNOBPs/s1600/vending+machine+japan+vegetables.jpg as on 23rd April, 2015

Fig.14: Trick to steal from vending machine

https://www.youtube.com/watch?v=mI7iieEBwZ4 as on 23rd April, 2015

Problems in the current vending machines

1. Most of the vending machines are designed for non perishable products or the packaged food with longer shelf life. But there are very few vending machines available for vegetables
2. The vegetable vending machines currently available in the market are much similar to locker / cupboard, with only one piece of vegetable inside it. Refer Fig. 12 & 13
3. These vending machines are entirely refrigerated. So, they can not be used to store vegetables which don't need refrigeration. E.g. Potato, Onion.
4. In traditional vending machines, the price of each item is required to be put manually. It is quite time consuming job and it is subjected to human errors.
5. Sometimes people use some tricks to steal items from vending machine. Refer Fig.14.
6. The loading of the trays of vending machine is very difficult.
7. Sometimes the entire tray falls down while refilling it.
8. Sometimes, people put their money into vending machine, but due to wrong way of loading the items in the vending machine, it gets interlocked with other items & it does not get dispensed.
9. In current vending machines, there is not any provision of carry bag option.
10. The interaction of human with the vending machine is through buttons only. These buttons are coded according to rows & columns. Hence, sometimes, people select different item than the one they require.

11. The labeling system which is being used in current vending machines is quite inappropriate for vegetable packets. Because, in current labeling system, we can put only price of the item. But For vegetables pack, its necessary to display its name, its packet weight, and its price.
12. These vending machines do not provide any statistical data about the number of items sold in one week.
13. Also, these vending machines do not send real time information about the number of items remaining in the machine.
14. Most of the times, the vending machine go out of service due to less number of coins for money exchange.
15. The form of the traditional vending machines available in the market is very much typical with exactly boxy shape. Also Most of the vending machines are having colour of black or grey. So, these vending machines do not look fresh.

User study

Persona

Family 1
Mr. Kulkarni [65 years] Retired person
Mrs. Kulkarni [61 years] House wife
Grandson [12 years]
- They mostly avoid to go long distances
- Can not lift heavy bags
- Grand son is quite small. He can not go out of the residential area

Family 2
Mr. Jadhav [27 years] IT Engineer
Cook [41 years]
- Working hours 9:00AM to 7:00PM
- No time to buy vegetables daily
- Market place away from home, so can not choose his daily menu
- Usually cook buys vegetables. But he doesn't have bike.

Family 3
Mr. Deshpande [41 years] Govt officer
Mrs. Deshpande [38 years] Job
- Working hours 10:00AM to 6:00PM
- Mrs. Deshpande is health conscious; she prefers fresh food everyday.

User scenario

Daily-use scenarios:

- People from society buy fresh vegetables everyday
- Service person re-fills the machine everyday in the morning

Necessary-use scenarios:

- Vending machine will send inventory data to centralized system. [about number of bags & empty racks]
- At the end of every month, the vending machine will provide the complete reports to understand sale and inventory information

Edge-case scenarios:

- Customer has placed the order by making the payment and power goes off. System did not dispense the product
- Store value card is not having sufficient balance in card
- Re-filled the store value card but it's not accepted by vending machine
- Payment has been made by customer and machine is not dispensing the product

Cultural issues & habits

While ideation I have to consider some socio-cultural issues while buying vegetables. Such as,

- People use their senses effectively while buying vegetables
- People check freshness of vegetables by its smell
- People check freshness & weight of vegetables by lifting it in hand
- People use destructive testing technique to check quality of vegetable. E.g. People break bhendi to take an inside look.
- People crush leaves of coriander to smell it
- People gently press tomatoes to check if they are totally ripen or not.
- People eat ground nuts to check its quality

Additional features

There are some additional features which can be added in the entire system of vegetable vending machine

- **Provide payment option by mobile**
  Now a days many people prefer to make money transactions by using online banking. So, this facility can be used in vending machine.

- **Intelligent take away system**
  If the customer is sitting in the office, and if he doesn't have any work, then he can use mobile app to make order and payment of vegetables. It will generate a code and customer can use this code to quickly collect vegetables from vending machine after coming to his apartment.

- **Check available vegetables on company website**
  Mobile application can be .developed which will tell customer about the available vegetables in the vending machine

- **Recharge store card Online**
  Online recharge facility can be provided for customer to recharge their store value card.

Area of installation

Vegetable vending machine should be installed at such area which is nearer to public places. Mostly at such areas which are crowded and which will be easily accessible to customers. Such areas can be roughly subdivided into two categories.

Open places:
Open places are the places which are easily accessible to common people and which are not under supervision of any security guard.

- Road side shops
- Subji mandi
- Jogging track
- Bus stops, Railway stations, Airports, Metro stations
- Over bridges, Sub-ways
- Signal-squares
- Gardens
- Foot path

Closed places:
Closed places are the places which are mostly under supervision of any security person or watchman. Accessibility to such places is slightly limited.

- Schools, Colleges
- Hotels
- Temples
- Shopping malls
- Parking of multistoried societies
- Govt & carporate offices
- Multiplexes, Theatres

Evaluation- Possible areas

Fig.15 shows evaluation of possible areas where vending machine can be installed. It was found that society parking area can be the best option among the listed areas.

Evaluation Criteria	Weightage	Roadside, Footpath, Signals	Over bridge, Subways	Jogging track	Bus stops, Railway & Metro stns	Vending carts	Subji Mandi	Hotels, Theatres, Shopping malls	Society parking	Schools, Colleges, Offices
Security	8	4	4	6	5	8	4	8	6	6
24x7 service	9	9	9	0	9	0	9	0	9	0
Dust/ pollution	4	0	2	4	2	2	2	3	3	3
Sunlight contact	4	0	4	0	4	0	0	4	4	4
Convenience of refilling	9	7	5	4	3	9	8	2	9	4
Installation cost	8	4	4	4	4	8	4	2	7	4
Buying Experience	6	3	4	3	4	4	4	5	5	4
Accessibility to young children [8-12 years]	4	2	2	2	1	2	2	0	4	0
Accessibility to bachelors	10	10	10	8	10	6	10	6	10	10
Accessibility to working couples	16	16	16	12	16	9	16	9	16	16
Accessibility to old people	12	12	12	8	8	12	12	7	12	0
Accessibility to home servant / cook	10	10	10	7	10	10	10	6	10	0
	100	77	82	58	76	70	81	52	95	51

Fig.15: Evaluation- possible area

Vegetables on rack

I interacted with around 30 to 35 people of different age group, different profession and of different states. After discussion with them I prepared a list of vegetables which can be kept in the vending machine.
The vegetables are as follow:
Okra, Bitter-gourd, Snake ground, Cauliflower, Fresh beans, Pumpkin, Shraddha beans, Green peas, Guar, Curry leaves, Onion, Potato, Tomato, Garlic, Cucumber, Capsicum, Red beat, Chilly, Ginger, Lemon, Coriander, Fenugreek, Brinjal, Mini Suva, Drumstick, Spring onion, Mushrooms, etc.

Then I selected the vegetables which most of the people eat or which are commonly used in kitchen.
These are-
Potato, Onion, Tomato, Curry leaves, Garlic, Red beat, Ginger, Chilly, Cucumber, Lemon, Coriander, Okra, Cauliflower, Pumpkin, Guar, Green peas, Fenugreek, Capsicum, Brinjal, Drumstick, Mushrooms.

Out of these vegetables, some are having good shelf life. So, I eliminated those from the list, as these items can be bought in bulk and stored for weeks in home refrigerators.
Final vegetable list:
Potato, Onion, Tomato, Curry leaves, Cucumber, Chilly, Coriander, methi, Bhendi, Cauliflower, Pumpkin, Guar, Capsicum, Brinjal, Drumsticks, Mushrooms

Standard weights & dimensions

No	Vegetable	Wt	L	W	H
1	Potato	1000 gm	200	150	50
2	Onion	1000 gm	200	150	50
3	Tomato	1000 gm	200	150	50
4	Curry leaves		200	150	20
5	Cucumber	500 gm	200	150	50
6	Chilly	250 gm	150	150	20
7	Coriander	250 gm	200	200	40
8	Okra	250 gm	200	150	30
9	Cauliflower	380 gm	190	140	50
10	Pumpkin Cubes	500 gm	190	140	50
11	Guar	250 gm	280	150	30
12	Capsicum	300 gm	200	150	60
13	Brinjal	500 gm	250	150	40
14	Drumstick	250 gm	200	100	40
15	Mushrooms	200 gm	165	130	30
16	Fenugreek	250 gm	200	200	40

Fig.16: Types of vegetables & volume

I visited vegetable markets like reliance fresh and Haiko. There I measured the dimensions of standard vegetable packages. Refer Fig.16.
It helped me to find out the entire volume occupied by vending machine. Refer Fig.17.
I considered an apartment of having 50 flats with 50 families.
I discussed the consumption rate of the listed vegetables with people to calculate approximate number of packs of each vegetables to be present at the time of refilling it.

1 family- 1 kg potato- 15 days
50 families- 50 kg potato, 15 days
So, per day this apartment requires 3.3 kgs [4 packs] of potato everyday.

Similarly approximate number of packs required for refiling of 1st 7 vegetables was calculated.

1 Family- every day- 2 Subjis
50 Families- every day- 100 subjis

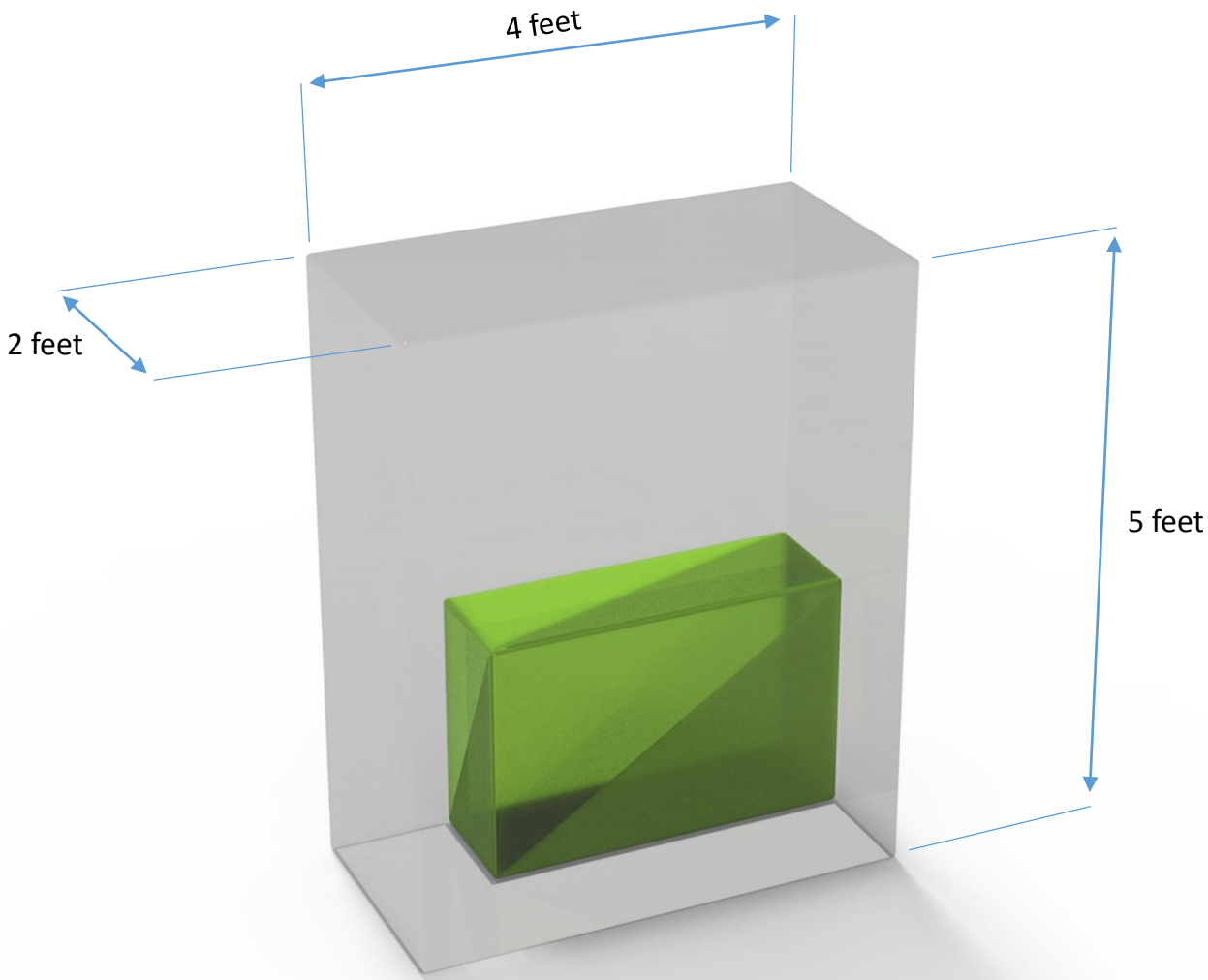
So, 100/9 = 11.11 bags are required
(From interview with service people in vegetable malls, I came to know that to avoid loss of perishable products like vegetables, approximately 60% of the expected number of vegetables are kept on the rack every day)
Hence approx. 7 bags of each vegetable will be kept available on the rack

Volume of vending machine

No	Vegetable	Wt	L	W	H	Days	Bags	Vol/bag	total vol
1	Potato	1000 gm	200	150	50	15	4	1500	6000
2	Onion	1000 gm	200	150	50	30	2	1500	3000
3	Tomato	1000 gm	200	150	50	15	4	1500	6000
4	Curry leaves		200	150	20	7	7	600	4200
5	Cucumber	500 gm	200	150	50	7	7	1500	10500
6	Chilly	250 gm	150	150	20	14	4	450	1800
7	Coriander	250 gm	200	200	40	14	4	1600	6400
8	Okra	250 gm	200	150	30	-	7	900	6300
9	Cauliflower	380 gm	190	140	50	-	7	1330	9310
10	Pumpkin Cubes	500 gm	190	140	50	-	7	1330	9310
11	Guar	250 gm	280	150	30	-	7	1260	8820
12	Capsicum	300 gm	200	150	60	-	7	1800	12600
13	Brinjal	500 gm	250	150	40	-	7	1500	10500
14	Drumstick	250 gm	200	100	40	-	7	800	5600
15	Mushrooms	200 gm	165	130	30	-	7	624	4368
16	Fenugreek	250 gm	200	200	40		7	1600	11200
								Total	1,15,908 cubic cm

Fig.17 Total volume of vegetables

Volume of vending machine



Vegetable volume = 2.75 ft x 1 ft x 2 ft

Machine volume= 4 ft x 2 ft x 5 ft

Fig.18 Approximate dimensions of vending machine

Human Factor

Approximate dimensions by convenience

To find out approximate dimensions of various parts of the vending machine and to find their relative distance form the ground level, a grid of 5 feet x 5 feet was made. People of different height were asked to stand in front of it and approximate position of various parts like, LED display, The height of the upper most & lower most rack from ground level, the maximum accessible width of vending machine, etc were noted down. Refer Fig.19, 20 and 21..

Fig.19: 5th percentile person

Fig.20: 50th percentile person

Fig.21: 95th percentile person

Insights

Insights

- Lower 2 ft (610 mm) height is not accessible. The vegetables kept below 2 ft from ground level are not at all visible

- For 5th percentile person convenient Display height is 4 ft 2 inches (Approx 1270 mm) from ground level
- For 50th percentile person convenient Display height is 4 ft 6 inches (Approx 1370 mm) from ground level
- For 95th percentile person convenient Display height is 4 ft 8 inches (Approx 1420 mm) from ground level

- The width of the vending machine should not be more than 6 ft (Approx 1830 mm)
- The upper most rack should be below 4 ft 6 inches (Approx. 1370 mm) from ground level.

Concept generation

Phase 1

In the initial stage of ideation, my focus was to add pleasant buying experience in the entire process. All the vegetable vending machines available in the market are much similar to kiosk type system which looks much similar to typical ATM.

So, I tried to break this mind set and tried to add pleasant experience in the overall vegetable buying activity.

Ideation

Here the vegetable boxes will be hung on the tree like structure with the help of specially designed hooks. These hooks will be opened by swiping registered debit/ credit/ store value card. And, that much amount will be deducted from the account of the customer. Refer Fig.22.

Here no need to interact with LED display to select vegetables.

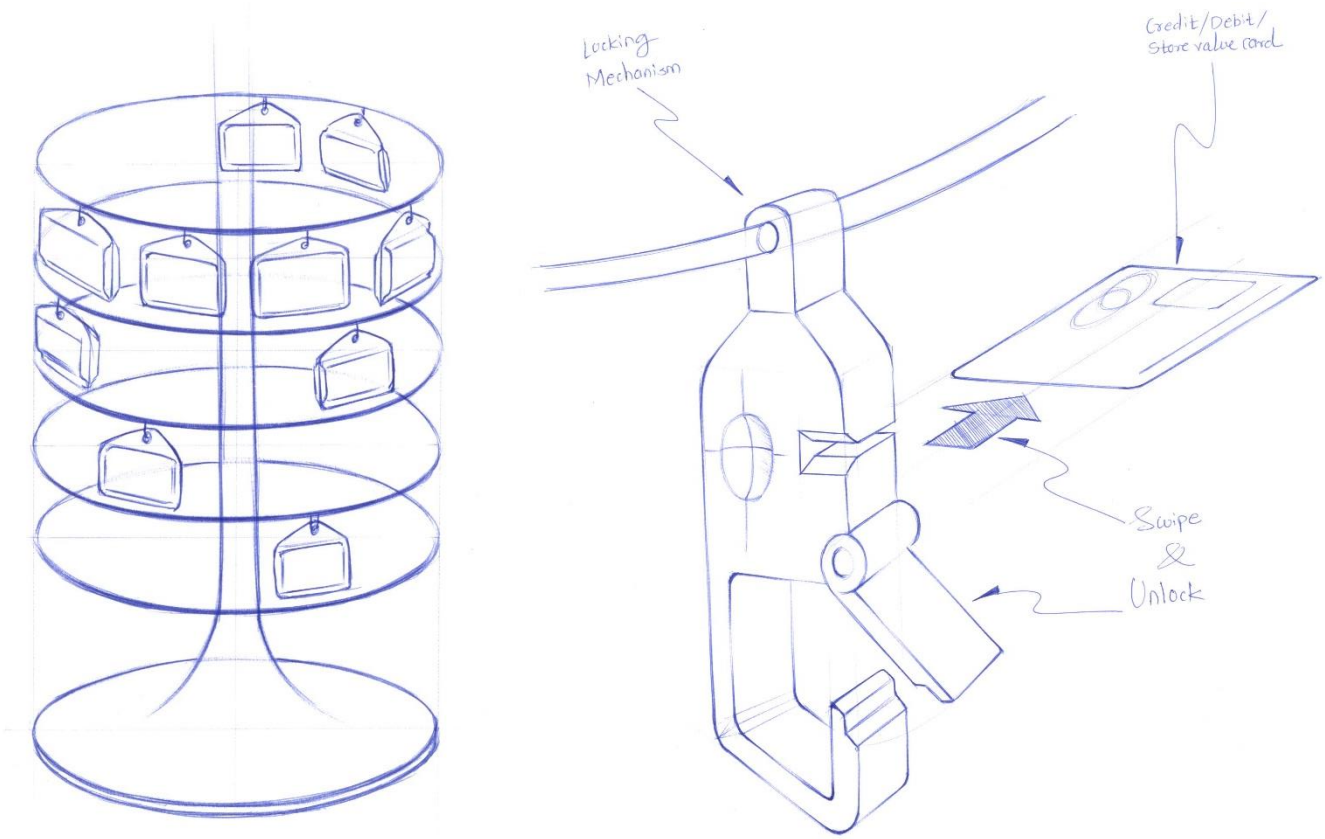


Fig.22: Hook & tree like structure

Ideation

Here the front glass of vending machine will be provided with hand gloves through which customer can interact with the vegetable boxes kept inside the machine. He can lift the vegetable boxes & take a closer look. Refer Fig.23. This gives customer some kind of freedom to choose vegetables from the rack.

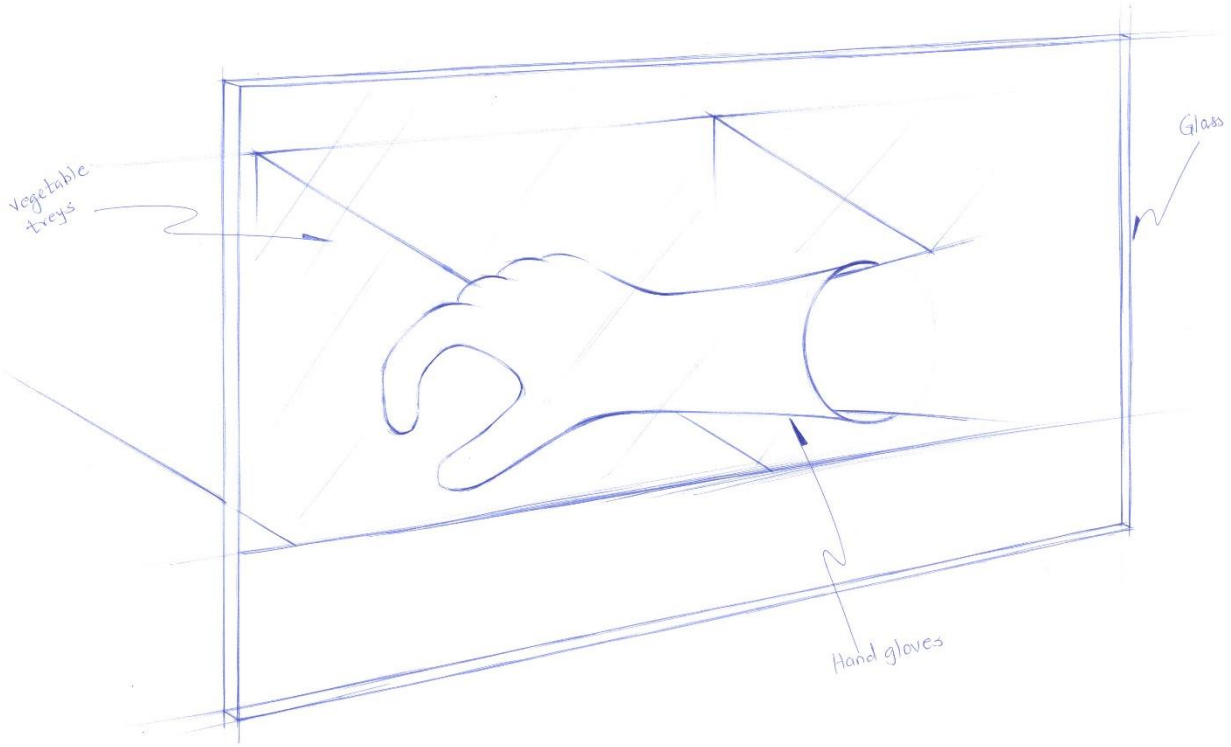


Fig.23: Interaction through gloves

Ideation

Here a robotic arm will be used to handle vegetables o the rack. Customer will input the list of required vegetables with the help of LED screen & the robotic arm will dispense the listed vegetables to the customers. Refer Fig.24.

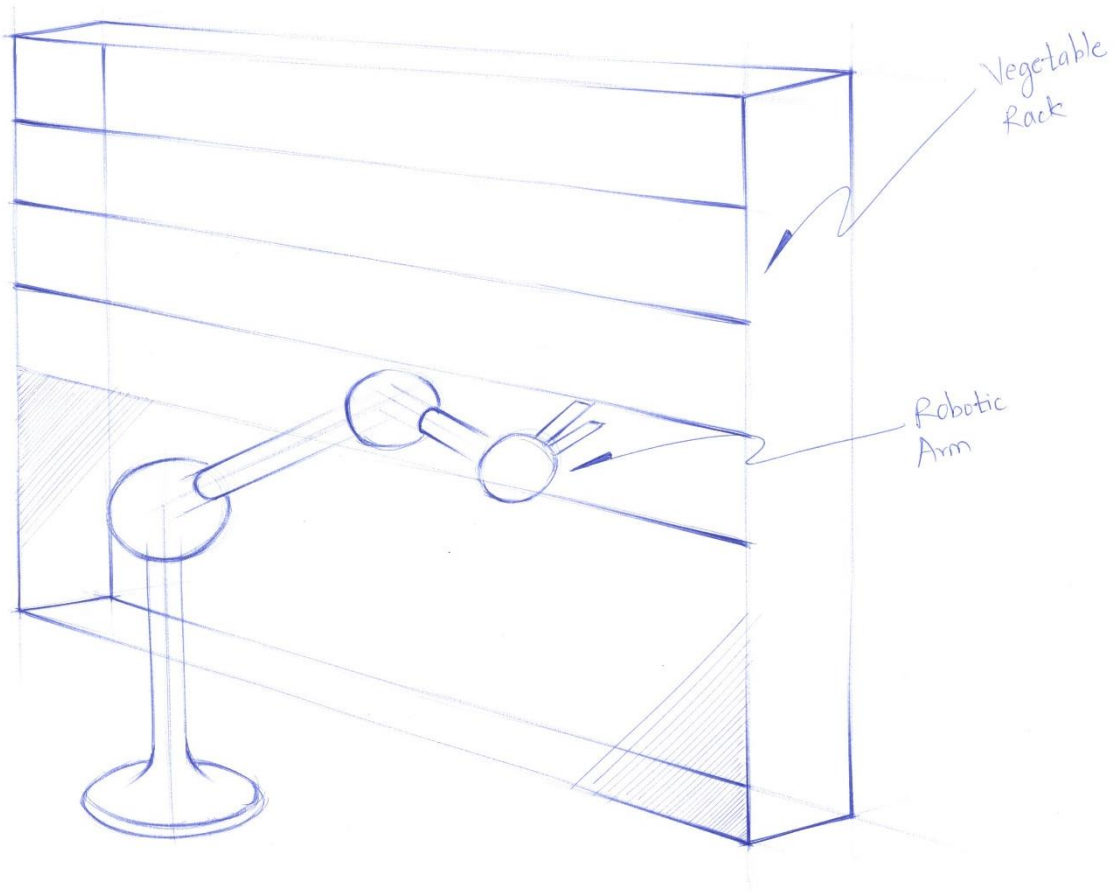


Fig.24: Robotic arm to dispense vegetables

Ideation

Here, the debit/ credit card will be used as security major. The customer is supposed to insert his debit card in the machine, then it will go inside & the door will get opened. Ref Fig. 25.
Then the customer can lift boxes of vegetables from the rack. The moment he lifts any box, the sensor in that compartment will sense it . Then that box will be added into virtual cart of customer & that much money will be deducted from his bank account.

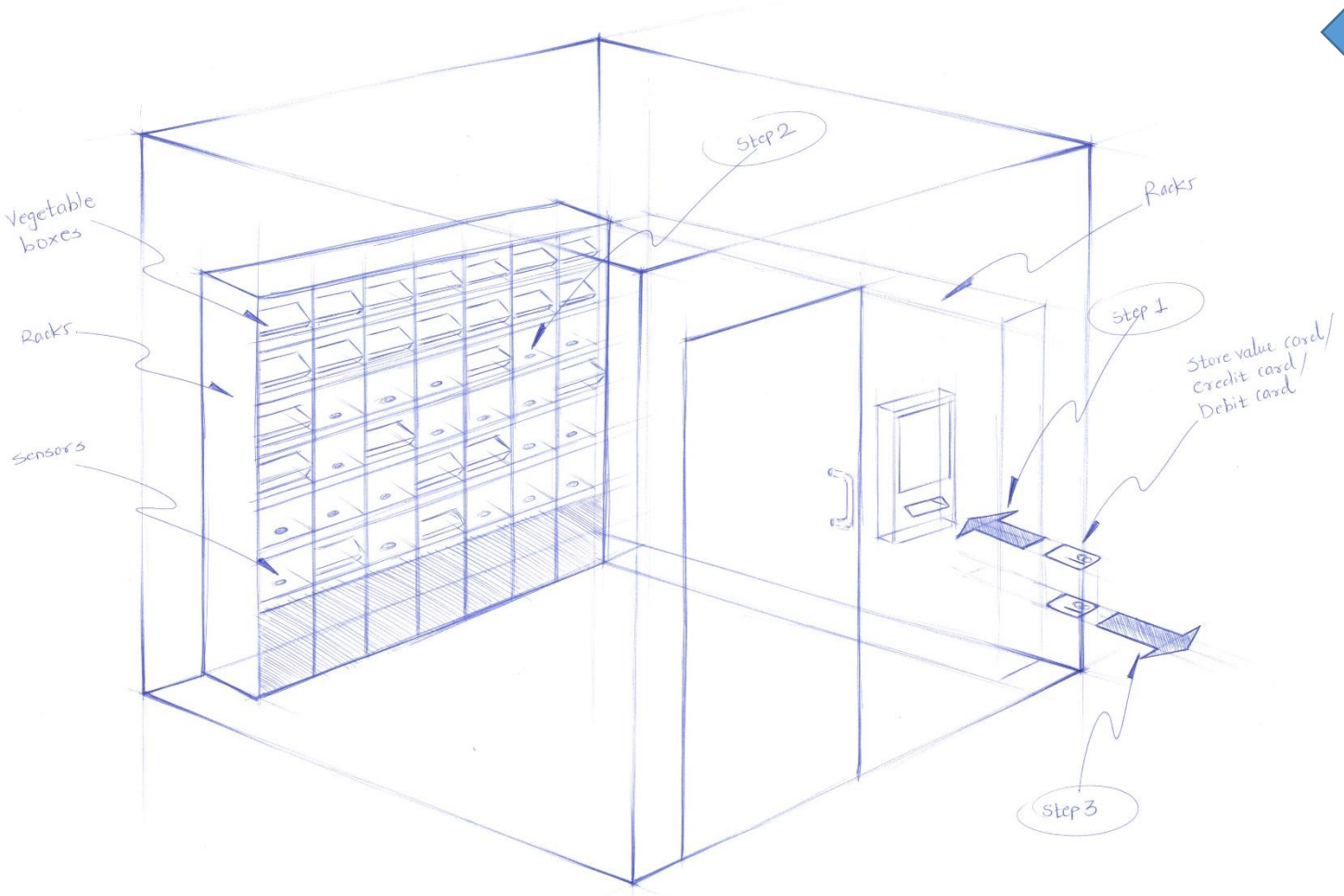


Fig.25: Vending machine with sensor

Ideation

Here, the vending machine will be in the form of Kiosk. Customer is supposed to input the list of vegetables. Then a drawer containing three boxes of the same vegetable will come out. Then the customer will choose one out of those. Then the drawer will go inside & again come out with three options of next vegetable. Refer Fig.26.
At the end, all the selected vegetables will be delivered at the bottom of vending machine.

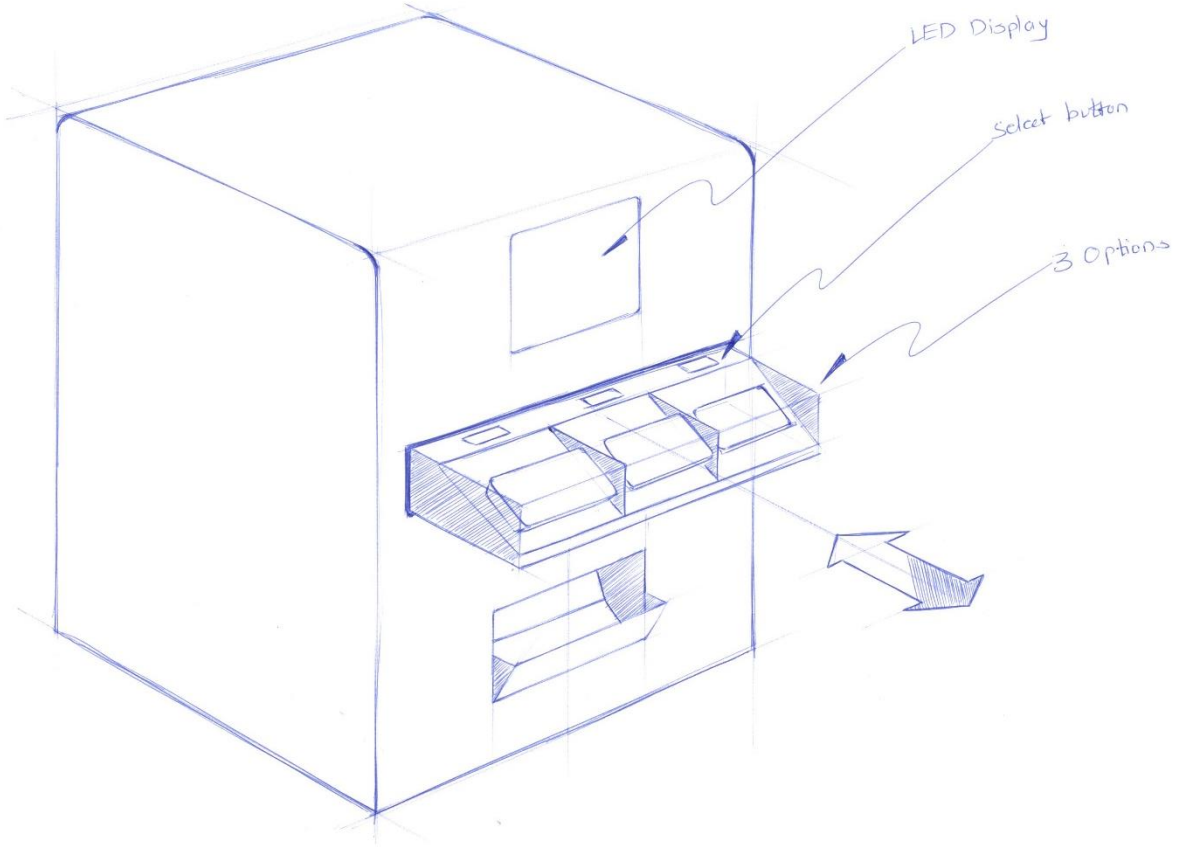


Fig.26: Vending machine with partial freedom to choose vegetables

Ideation

Here, the storage area of the vending machine will be built underground. As the average temperature of the soil is less than environment, and as it become more cool in the presence of water, it can be used as natural refrigeration medium for vegetables. Refer Fig.27.

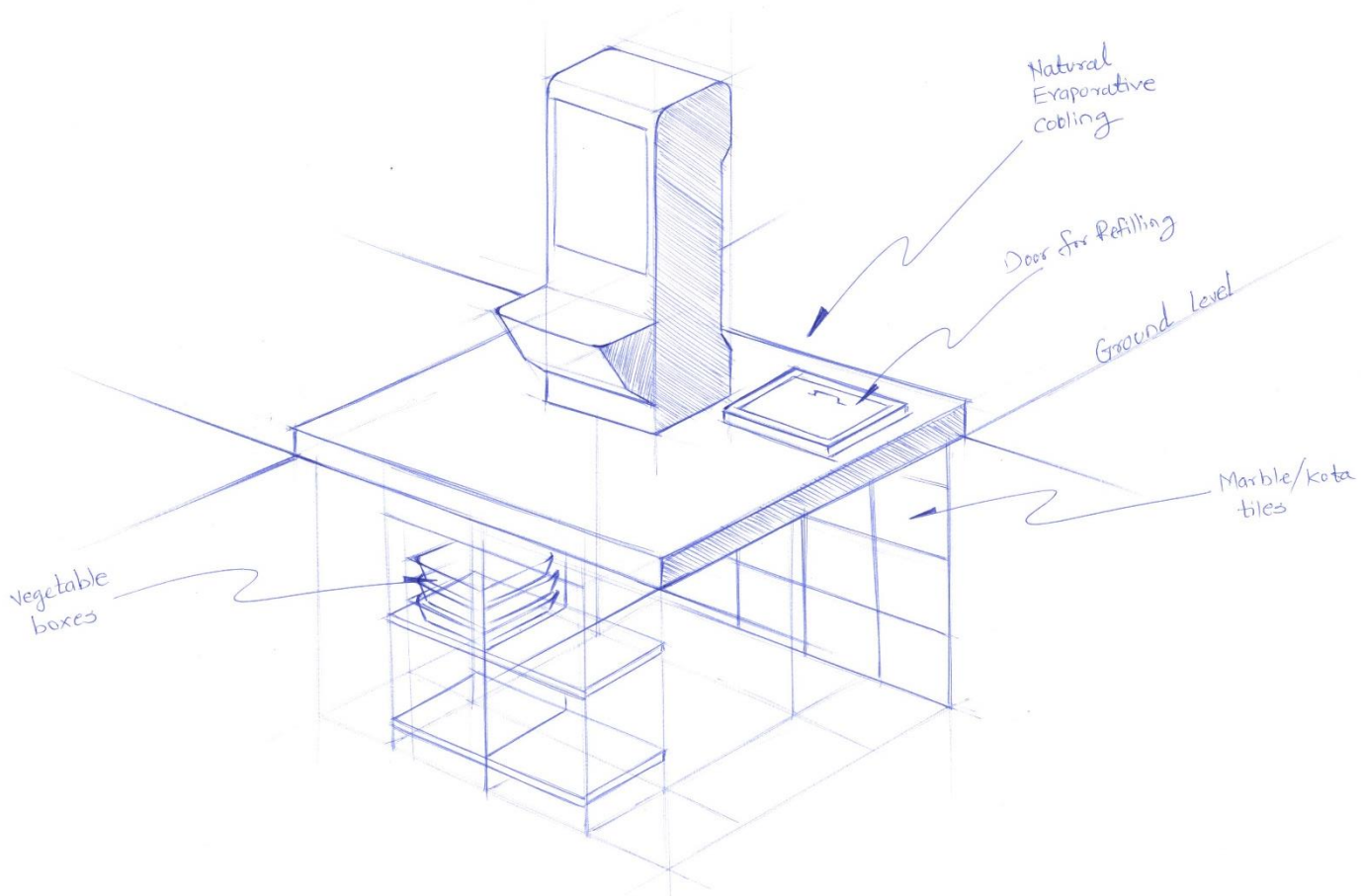
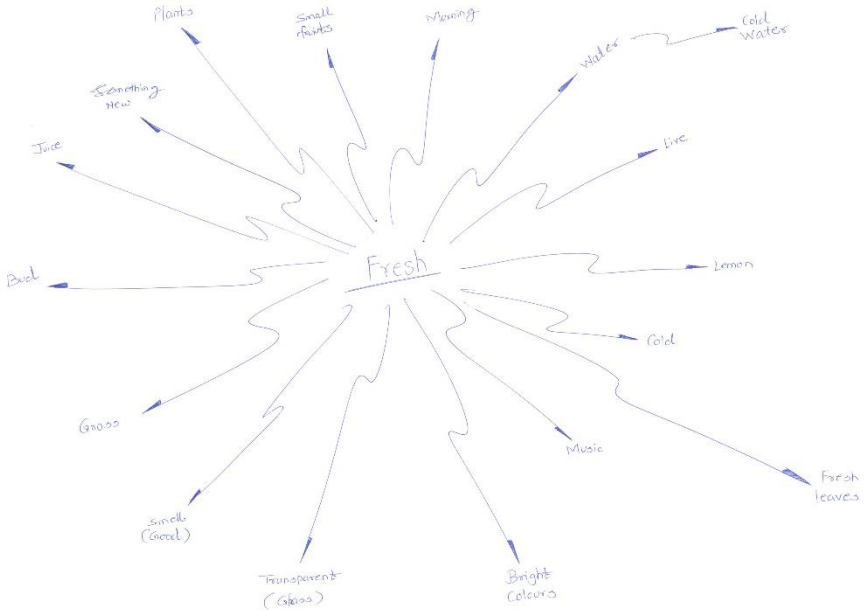
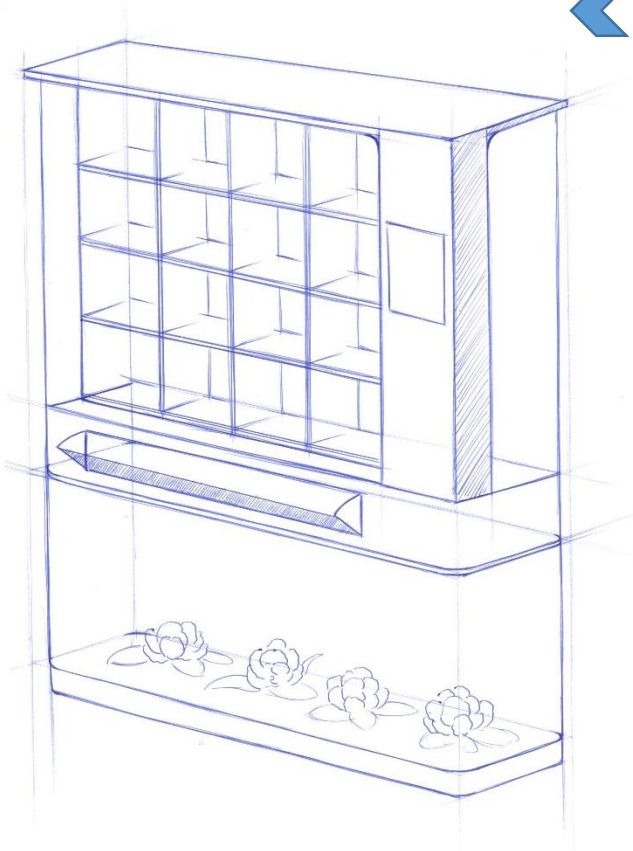


Fig.27: Vending machine with storage area under ground level

Ideation





Here conscious effort was taken to integrate “freshness” into the vending machine. A word cluster was made and the insights were taken out of it.
Here, vegetables will be planted in the lower 2 feet portion of the vending machine. It will be assisted by plant growing lights (UV-LED bulbs) The service person will take care of its maintenance. Refer Fig.28. These UV bulbs emit pleasant violet colour light which can be used for ambiance creation near gathering area.

Fig.28: Vending machine to depict freshness

Ideation

Here modular concept was used to make vending system more flexible. Some vegetables are seasonal. So to accommodate those vegetables in that particular season in vending machine, modular concept can be used.
Also some interesting pattern can be made out of it. Refer Fig.29.

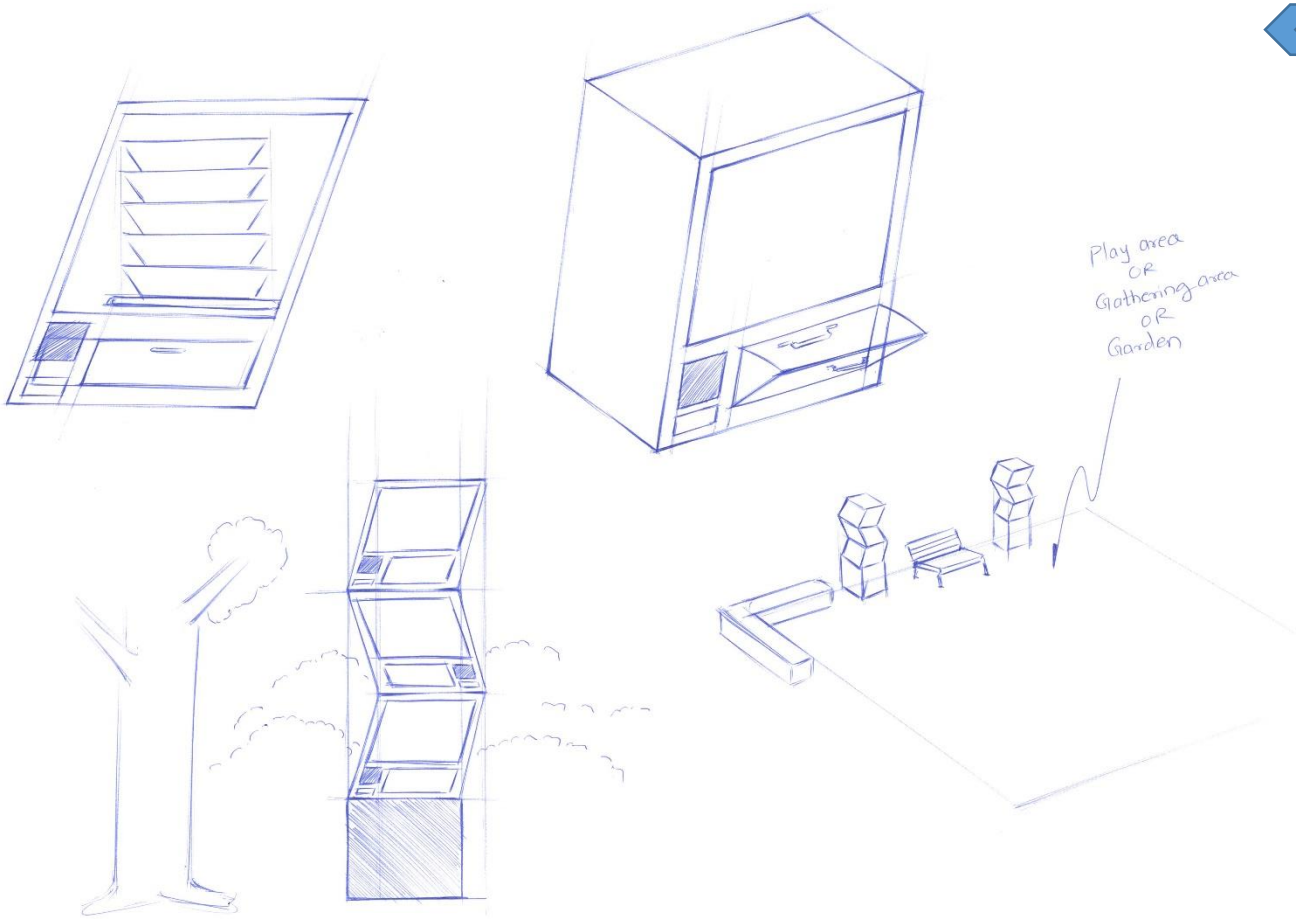
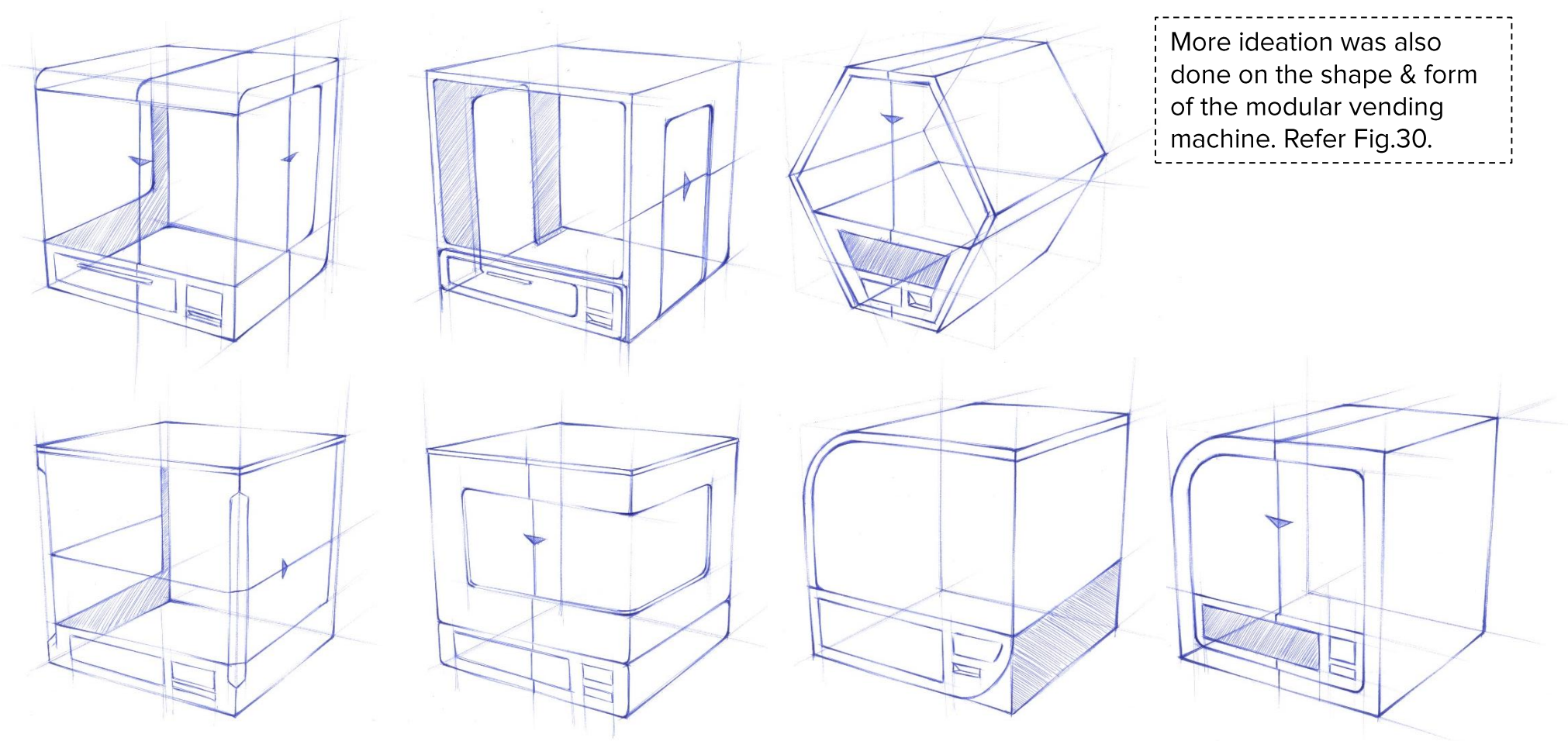


Fig.29: Modular vending machine



More ideation was also done on the shape & form of the modular vending machine. Refer Fig.30.

Fig.30: Modular vending machine- form exploration

Concepts

I selected three feasible ideas & detailing was done. Then 3D model was made & the entire system of all three concepts was analyzed by role play method & taking feedback from customers. Fig.31 shows concepts 1, 2 and 3.

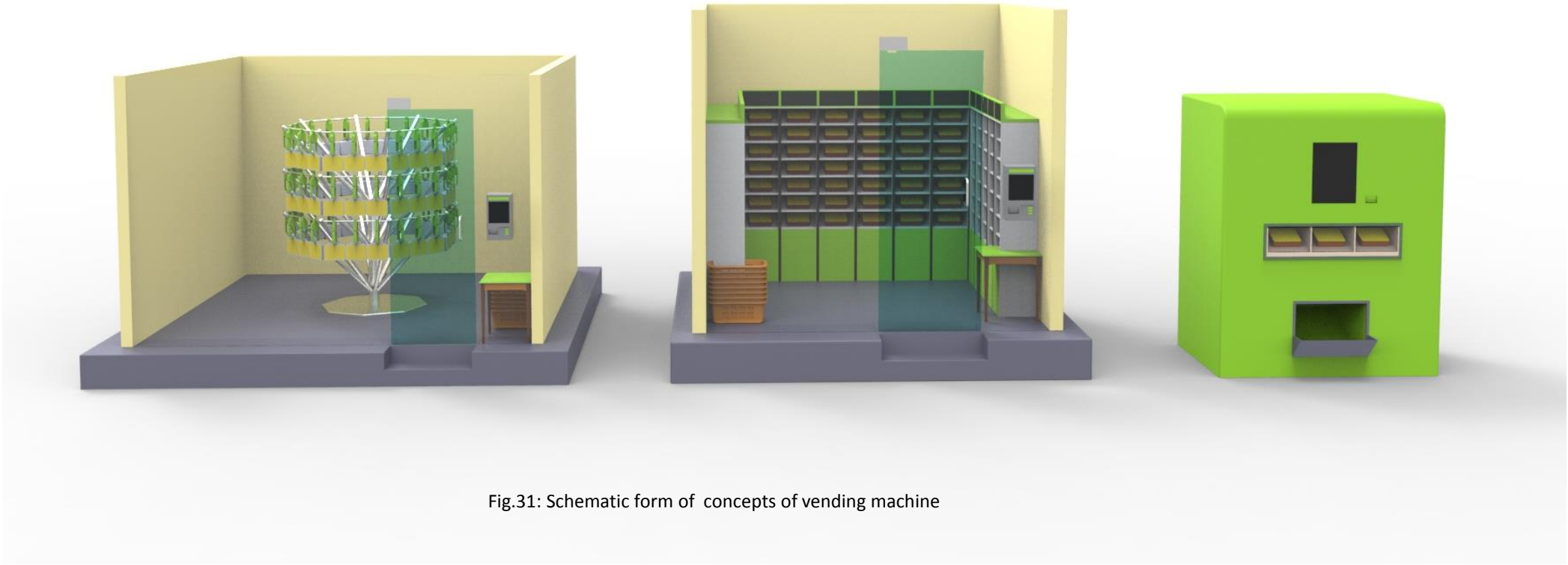


Fig.31: Schematic form of concepts of vending machine

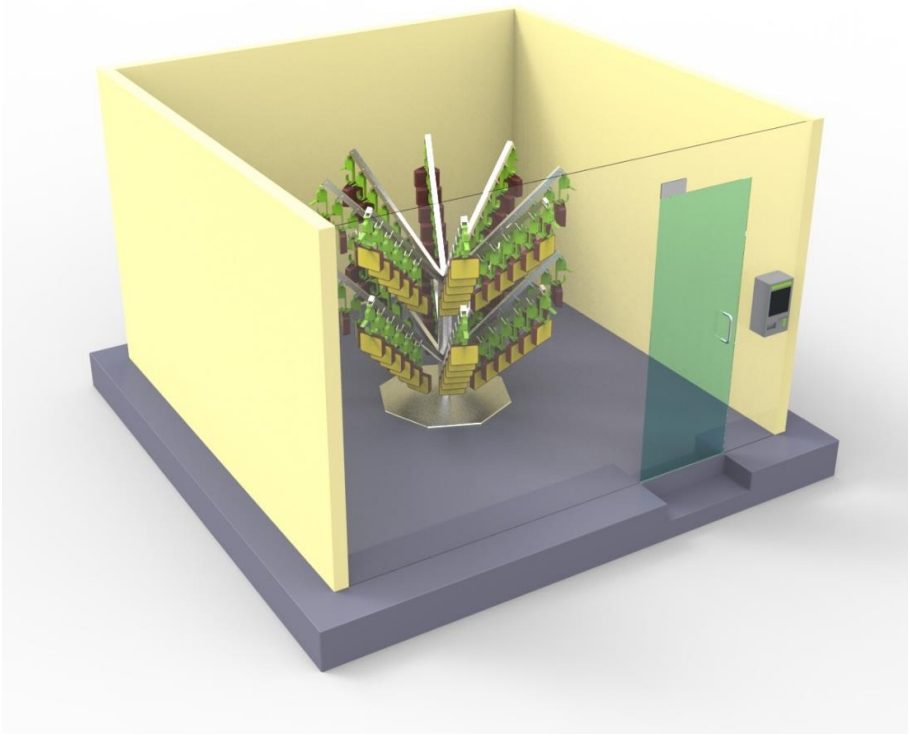


Fig.32: Concept 1

Concept 1

In this concept, the vending machine will be inside a room of dimensions 9 ft x 9 ft carpet area. There will be a door at the front side which will be monitored by a machine which is mounted on front glass wall. The vegetables boxes will be hung a tree like structure with the help of special hook which can be operated with the help of debit/ credit card only. Fig.32 shows schematic form of the concept.

1. Service person will arrive in the morning with the vegetables in the crate.
2. He will swipe his company card and enter security code. Then the door will get opened. Also all the hooks on the tree structure will also get opened.
3. He will go inside and refill the empty spaces and go away.
4. Customer will come & swipe his card. Enter security code.
5. Door will get opened. He will go inside.
6. He will choose vegetable box to buy. He will swipe his card through the hook. The hook will get opened.
7. He will collect that box. The moment hook opens, that vegetable box will be added to virtual account of the customer & that much amount will be deducted from his account.
8. Then he will collect all the boxes in carry bag and go out.

[Refer Fig.33 & 34]

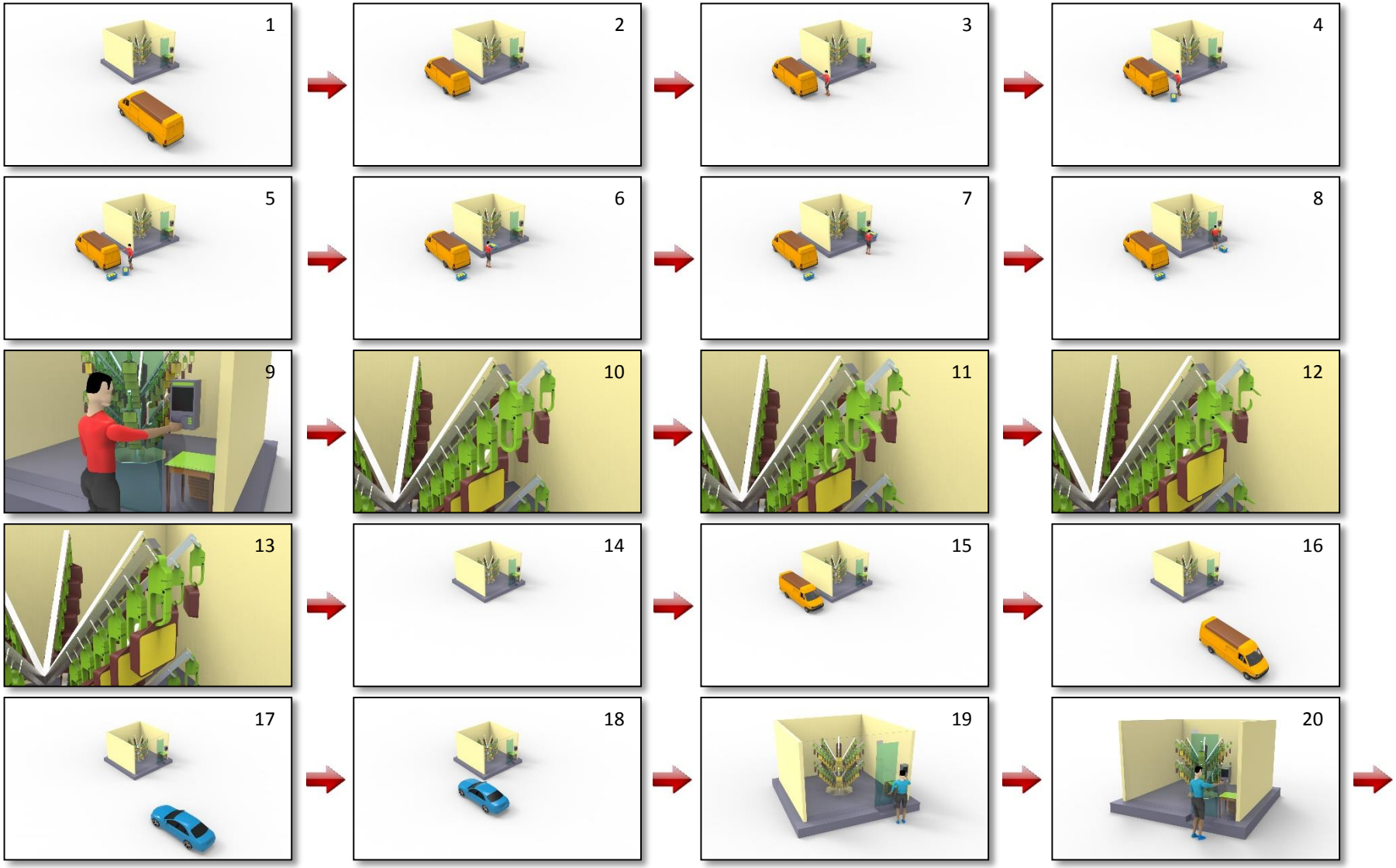


Fig.33: Stepwise working of concept - 1

Person in Red shirt - Service person
Person in Blue shirt - Customer

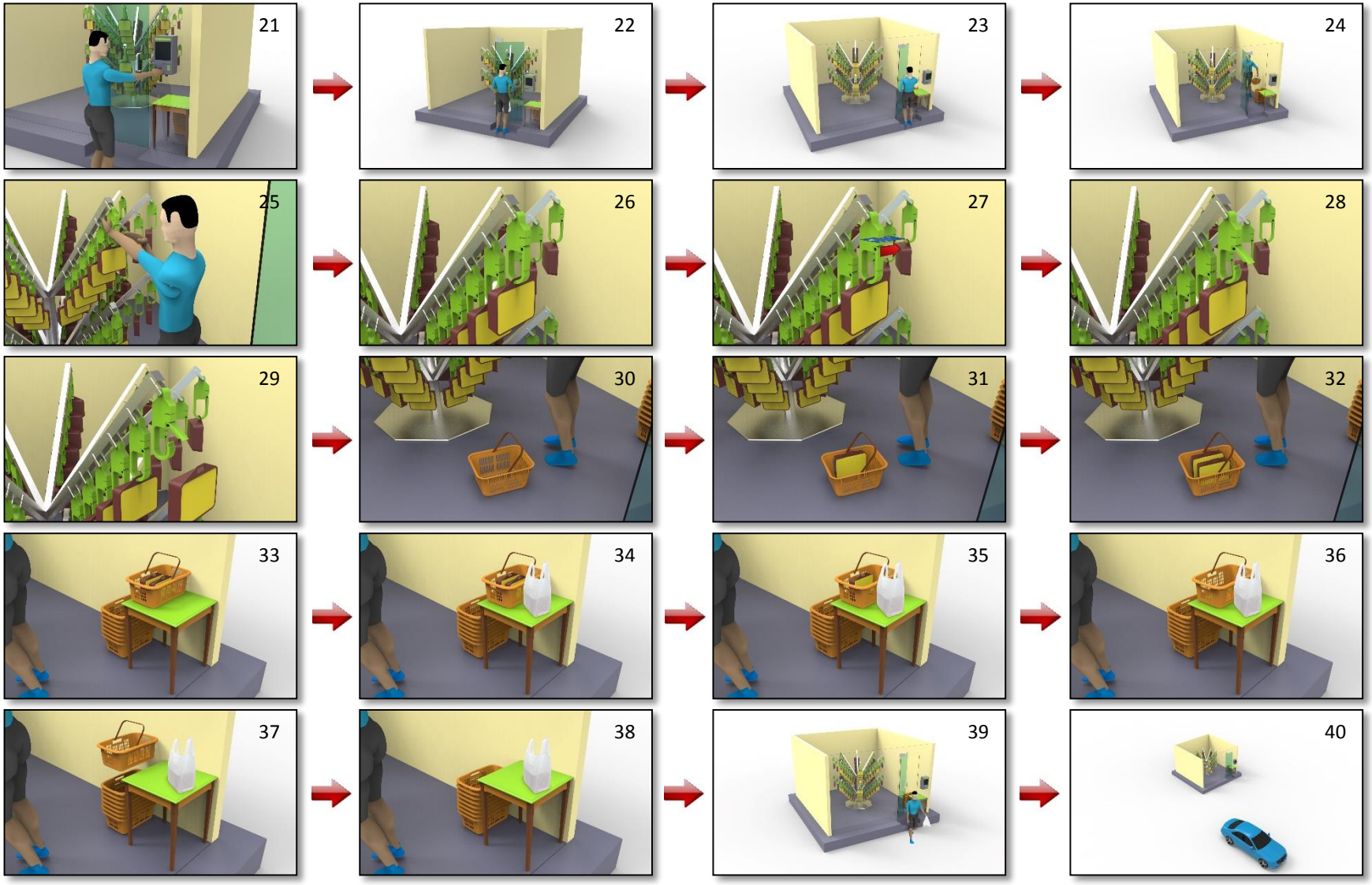


Fig.34: Stepwise working of concept - 1

Person in Red shirt - Service person
Person in Blue shirt - Customer

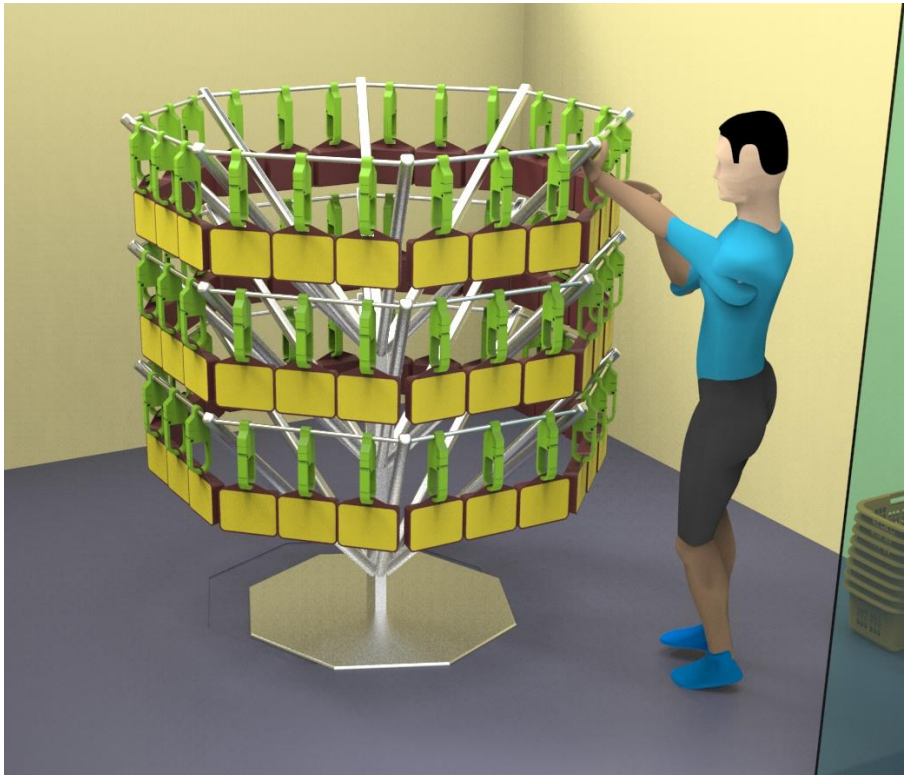


Fig.35: Concept 1 (Modified)

Concept 1 [Modified]

Problems identified in the tree structure-

- Boxes are hung one behind the other.
- Can not swipe card through the inner most boxes.
- Accessibility to lower most boxes is very less.
- Low visibility to inner most boxes.

Hence to address these problems, the design was modified. Fig.35 shows the schematic form of the modified concept. Here all the boxes are hung one beside the other in a straight horizontal line. SO, it gives customer better visibility of all the boxes & also it allows customer to swipe his card easily through the hook.

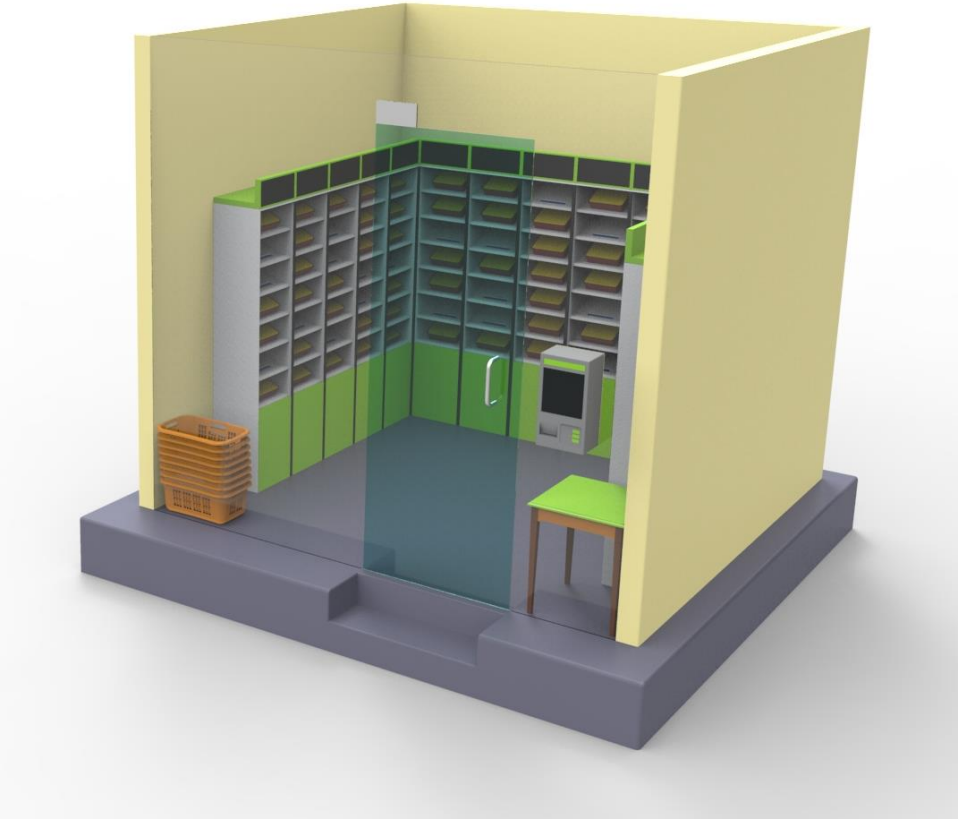


Fig.36: Concept 2

Concept 2

In this concept also, the vegetables will be kept inside a room of carpet area approximately 9 ft x 9 ft. Here, the debit card/ credit card/ store value card will be used as security major. A scanning machine will be installed on the outer wall of the machine. Inside the room, all the vegetable boxes will be kept individually in each compartment. Each compartment will be having proximity sensor. Fig.36 shows the schematic form of the concept.

1. Service person will come in the morning and he will swipe his card. The doors will get opened.
2. He will refill all the empty compartments with vegetable boxes. The sensor in each compartment will scan the code on the bottom of the box & will store that in the system memory.
3. Customer will come & he will scan his card. His card will go inside the scanning machine. He will put security code. The door will get opened & he will go inside.
4. He will pick up vegetable and come out. Then he will again put security code & do the online money transaction through LED screen. Then only the card will come out.
5. He will collect the card and go away.

[Refer Fig. 37 & 38]

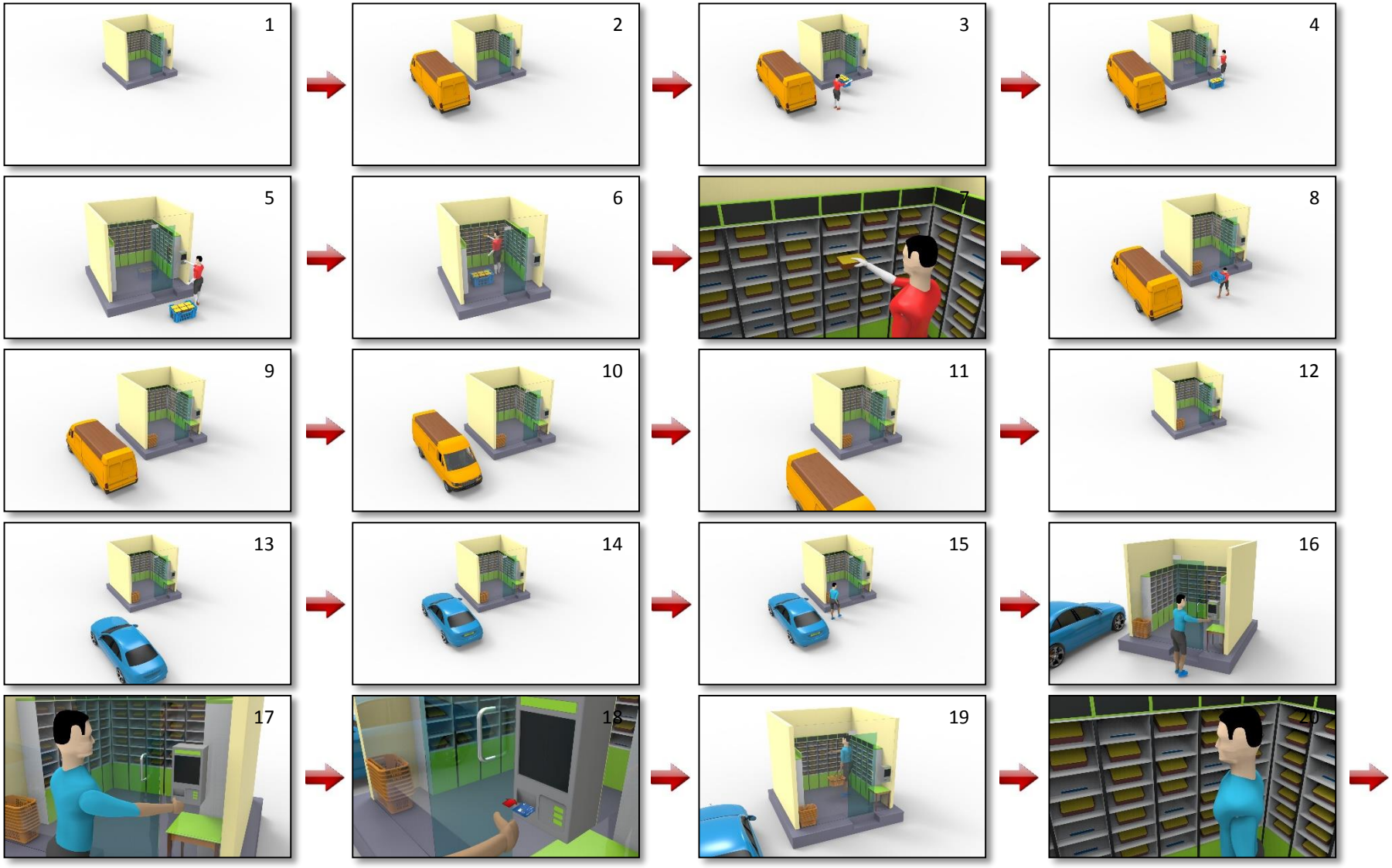


Fig.37: Stepwise working of concept - 2

Person in Red shirt - Service person
Person in Blue shirt - Customer

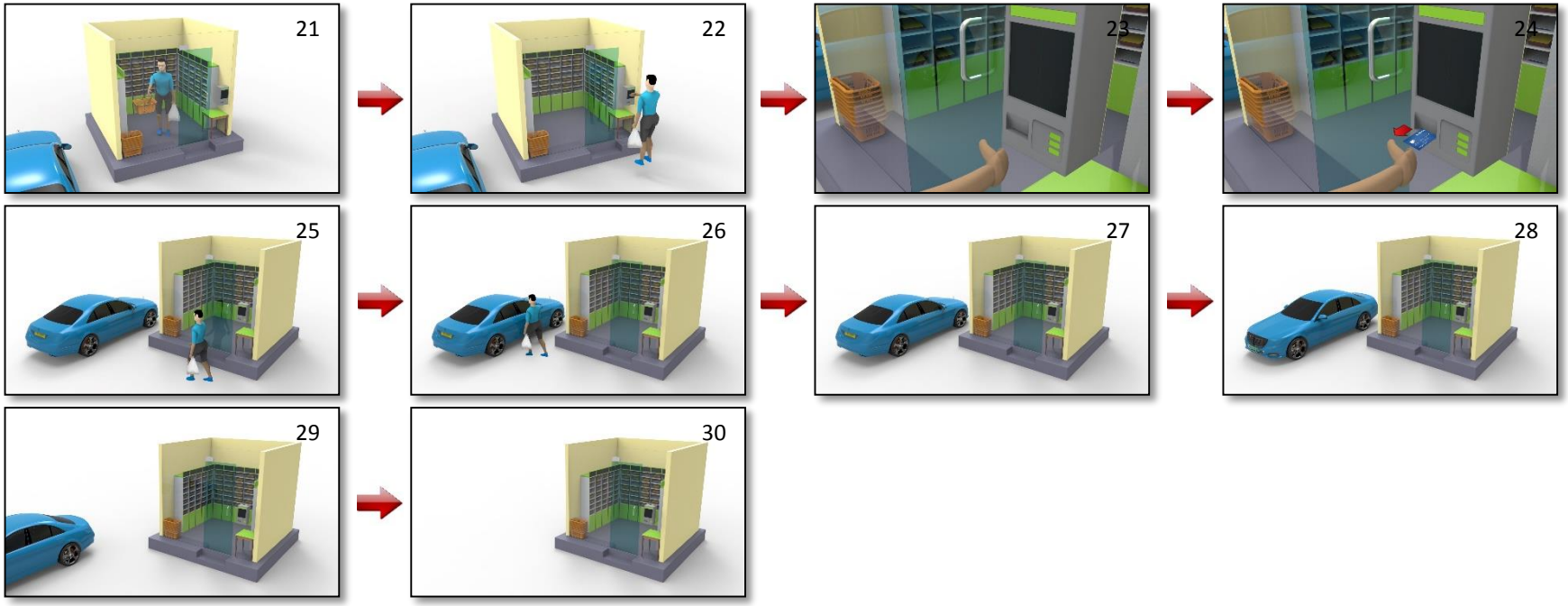


Fig.38: Stepwise working of concept - 2

Person in Red shirt - Service person
Person in Blue shirt - Customer

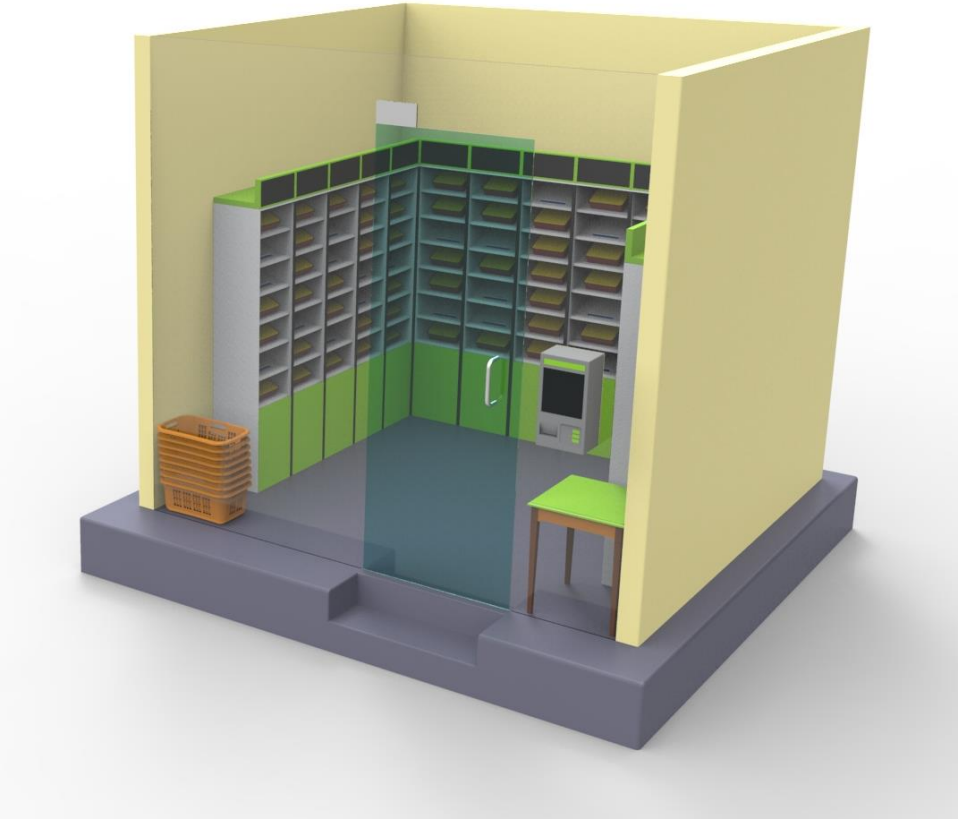


Fig.39: Concept 2

Concept 3

In this concept, vending machine is in the form of kiosk. It consists of a LED screen, a drawer with three compartments & a delivery port. In this concept, customer gets partial freedom to choose vegetable box. Fig.39 shows the schematic form of the concept.

1. Service person will come in the morning & he will open the back door of the machine by entering security code in the LED screen.
2. He will refill the machine & lock the door & go away.
3. Customer will come & swipe his card.
4. He will select the vegetables by using LED screen
5. Then the drawer will come out with three boxes of the same vegetable.
6. Customer will chose the box out of three & press the button of that compartment.
7. The drawer will go in.
8. Again it will come out with three boxes of next vegetable.
9. The cycle repeats until all the vegetables are selected.
10. Then the money transaction will be done, and the selected vegetable boxes will be dispensed into delivery port .

[Refer Fig. 40 & 41]

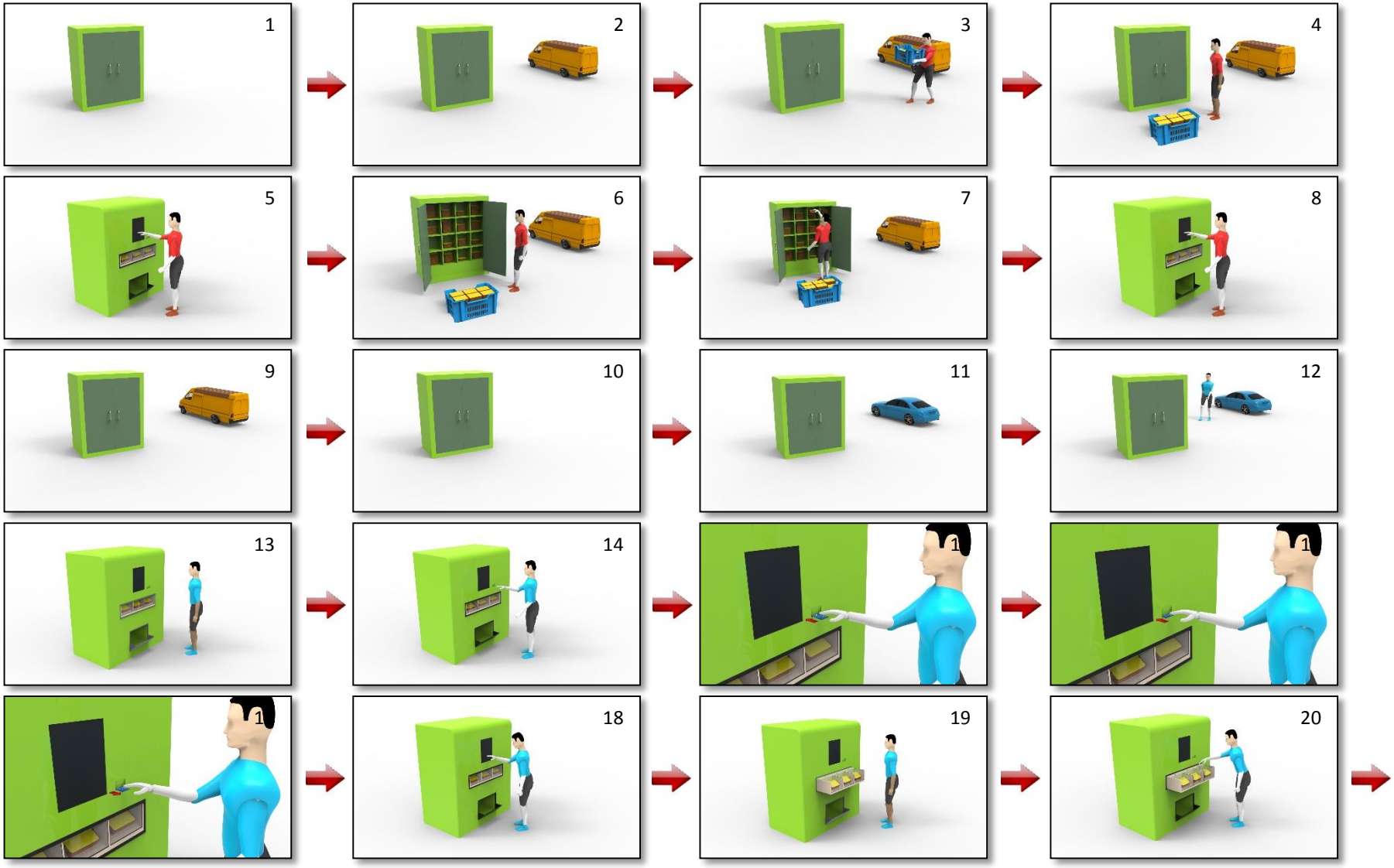


Fig.40: Stepwise working of concept - 3

Person in Red shirt - Service person
Person in Blue shirt - Customer

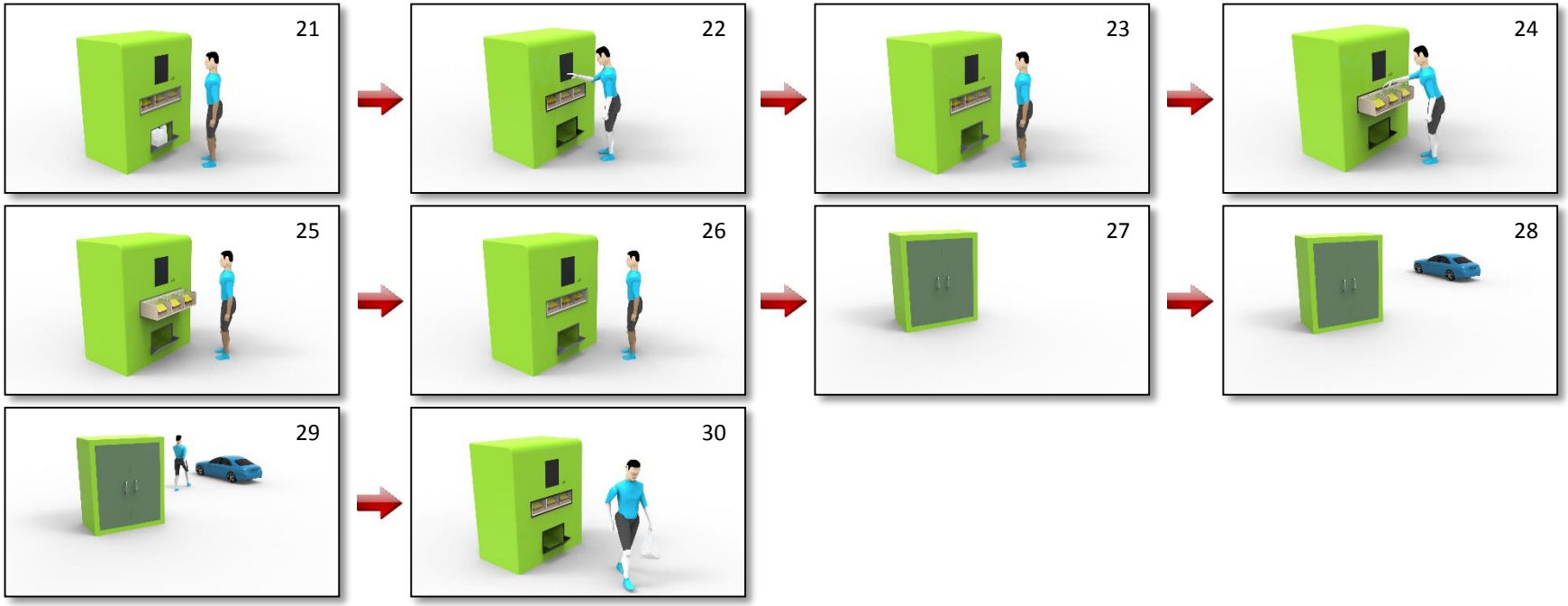


Fig.41: Stepwise working of concept - 3

Person in Red shirt - Service person
Person in Blue shirt - Customer

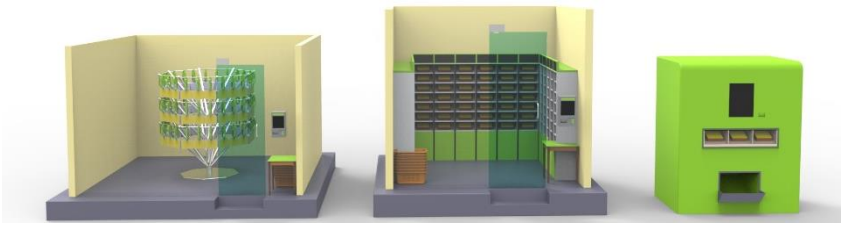
Concept evaluation

After making 3D models of the three concepts, evaluation was done. Evaluation was done by using two methods.

Methode 1-
Defining criteria & giving weightage to each criteria according to importance. And then evaluating each concept with respect to these criteria & its weightage.
For this I asked 5 people to give rating to these concepts. & then the average count was considered as final one.

Methode 2-
In this method approximately 25 people were interviewed. Also a construction company manager & an architect were interviewed..
The 3D models & stepwise operation of each concept was explained to them. & then they were asked to role play. Then the feedback was taken.

Evaluation [Method 1]



Following results were obtained. (Refer Fig.42.)

No	Criteria	WTG	Concept 1	Concept 2	Concept 3
1	Uniqueness	14	14	10	14
2	Experience	14	14	10	14
3	Convenience	12	8	12	12
4	Ground area required	12	8	8	12
5	Visibility	10	8	10	5
6	Durability	10	5	10	8
7	Minimum step interface	8	8	6	4
8	Fast operation	8	4	5	8
9	Security	8	6	6	8
10	Use by multi-people at a time	4	4	0	0
		100	79	77	85

Fig.42: Evaluation chart

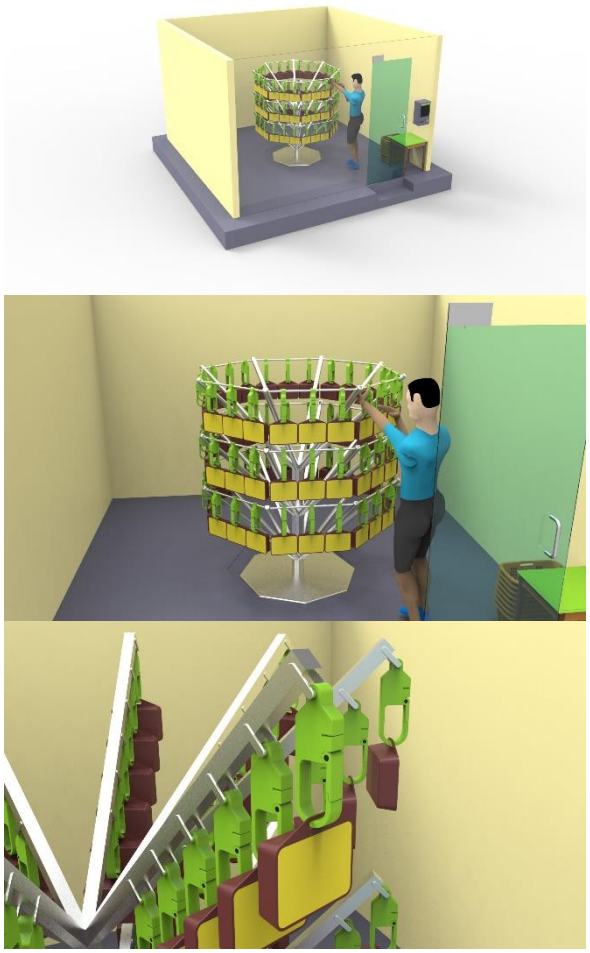


Fig.43: Concept 1

Evaluation [Method 2]

Concept-1 (Refer Fig.43)

Pros-

- Exciting process of shopping vegetables
- Simple step money transaction
- Customer can hold the box in hand & take closer look

Cons-

- Customer has to use both hands [one to hold hook & second to swipe card]. So, every time he has to put basket down on the floor.
- No dedicated space for labeling the name/ weight/ price of vegetables
- Customer can not see entire range of vegetables from outside the room
- Hook- moving part- frequent use- Less durability
- No separate arrangement for refrigeration of vegetables like onion & potato [Who don't need refrigeration]
- Debit/ credit card may get damage due to frequent use
- Comparatively more ground area required
- Comparatively complex box packaging
- Low space utilization. Large carpet area required
- Number of boxes on rack- 72

Fig.44: Concept 2

Evaluation [Method 2]

Concept-2 (Refer Fig.44)

Pros-

- Good visibility of entire range of vegetables from outside the room
- Dedicated space for labeling the name/ weight/ price of vegetables
- Minimum step money transaction
- Number of boxes on rack- 112

Cons-

- Volume of the vending machine is quite large which may result in high material cost
- Low space utilization. Large carpet area required
- No separate arrangement for refrigeration of vegetables like onion & potato [Who don’t need refrigeration]

Fig.45: Concept 3

Evaluation [Method 2]

Concept-3 (Refer Fig.45)

Pros-

- Least ground area required
- Compact design
- Separate arrangement for refrigeration of vegetables like onion & potato [Who don't need refrigeration]
- Unique design

Cons-

- Complex working mechanism required
- No visibility of available vegetables inside the machine

Insights

Insights from the evaluation-

- Parking area is a major issue in society parking- Carpet area of machine should be minimum
- As the volume of machine increases, manufacturing cost increases- Machine should be compact
- People have enough trust on vegetables from branded outlets. E.g. Haiko, reliance fresh, etc. – No need to selection
- People [mostly elderly people] find it easy to adopt new thing if it similar to some existing system.
- People prefer to have a clear visibility of entire range of vegetables

Conclusion

After analyzing the insights from concept evaluation and taking feedback from customers, the decision was taken not to go for experience design.
The vending machine will be similar to a kiosk
Further ideations were done mainly on the three areas-

- Mechanism
- Form
- Interface

Concept generation

Phase 2

I did ideations on three individual levels.

1. Working mechanism of vending machine. How the vending machine will actually work and vend the vegetables safely to costumer.

2. Form of vending machine. Form of the vending machine should be such that, it will look fresh & slightly futuristic. It should create confidence in customer so that he wont be doubtful about quality & quantity about vegetables delivered by it. Also it should help to create brand identity of the vegetable vending machine.

3. Interface of vending machine. How the costumer will interact with vending machine while ordering vegetables from vending machine both online and standing in front of vending machine by using LED display.

Ideation- Mechanism

Here a helical coil is used to push vegetable packs and deliver it to vending machine opening. The helical coil will be pre-calibrated according to the number of revolutions and the number of packs delivered. Side supports are provided for forward motion of packs. Refer Fig.46.

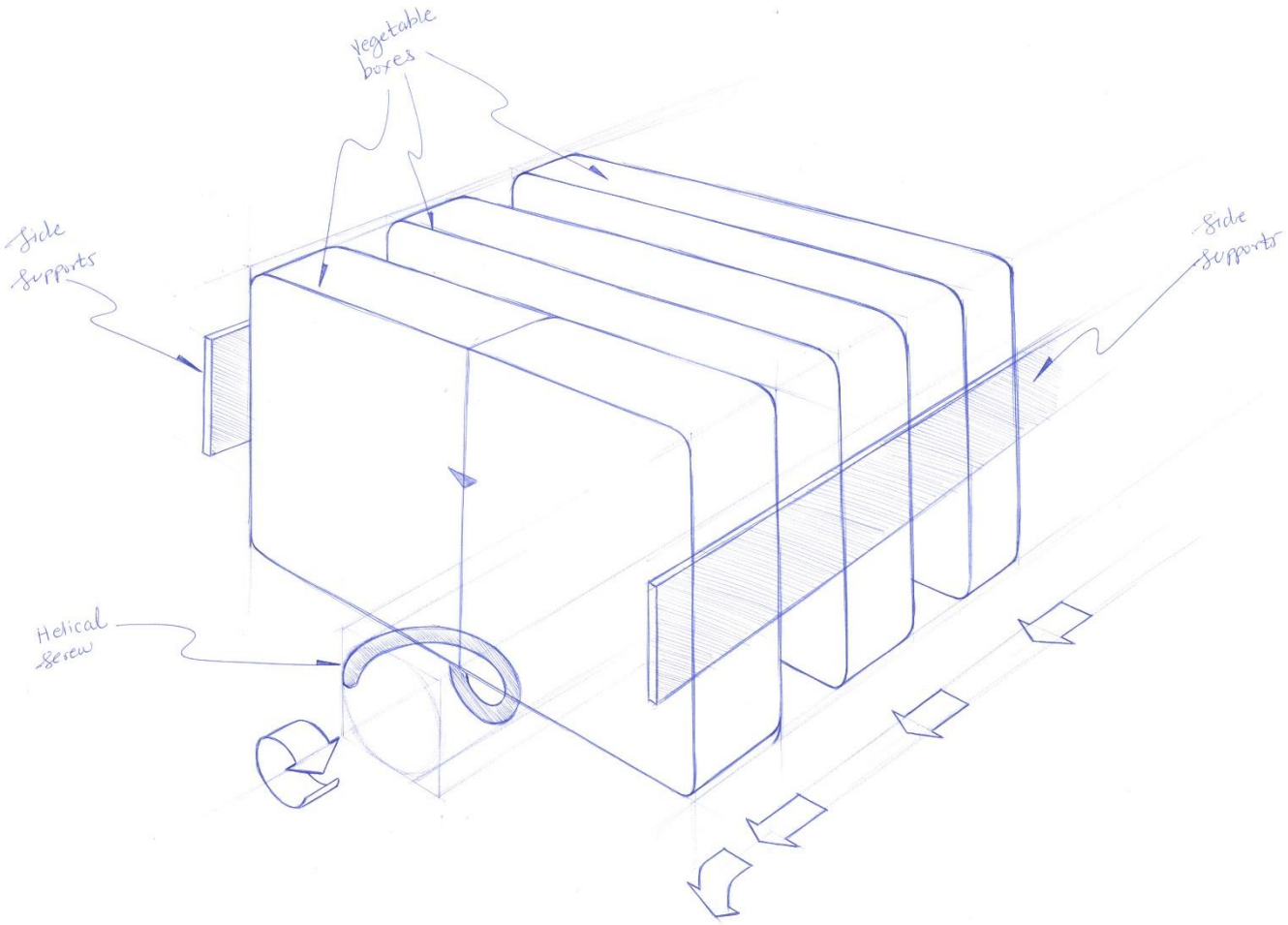


Fig.46: Ideation-Mechanism

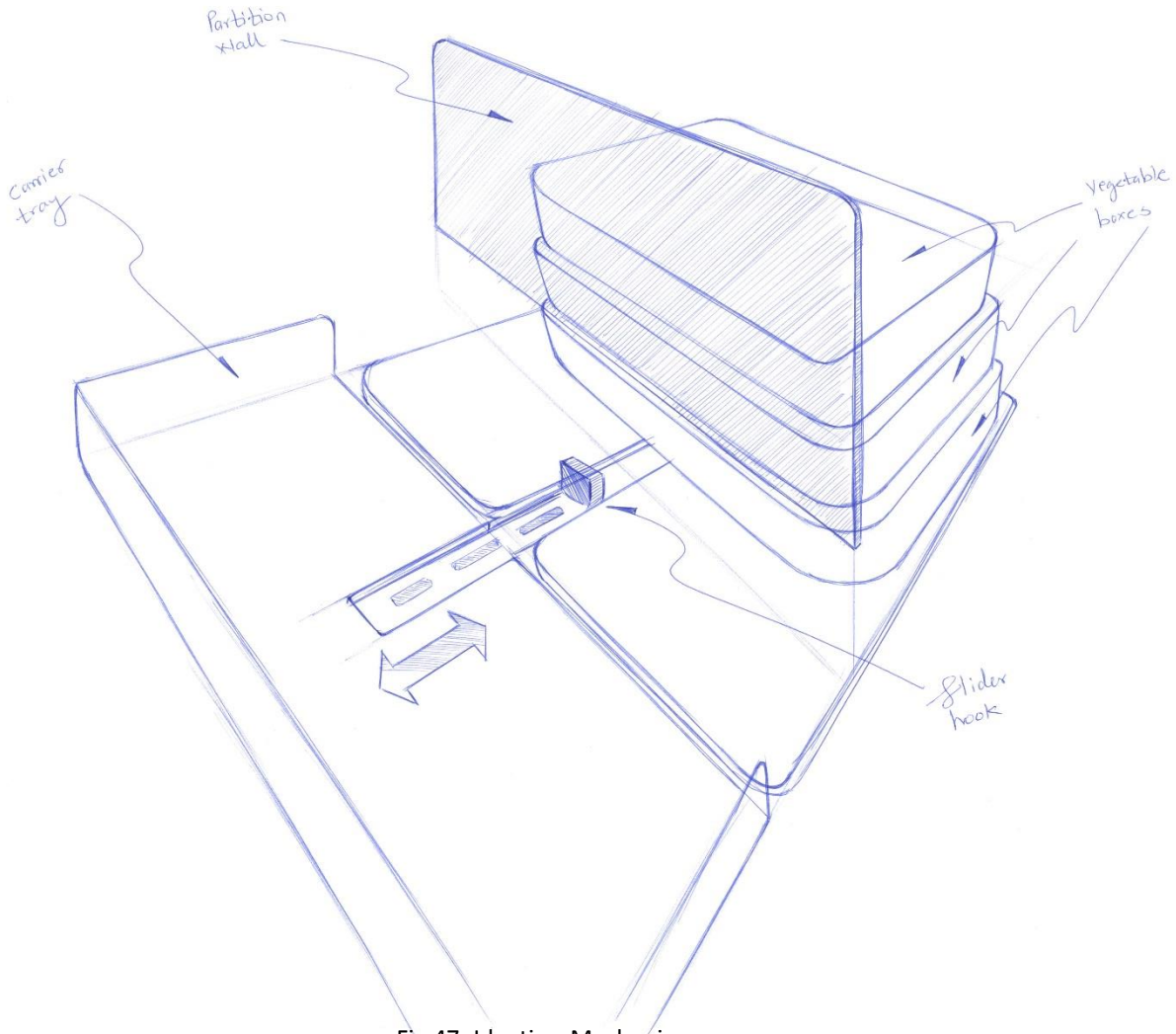


Fig.47: Ideation-Mechanism

Ideation- Mechanism

Here a separate tray will be provided which will be guided according to its Horizontal [X axis] & vertical [Y axis] motion. It will have a hook below it, which will pull the packs into tray. Partition wall will keep other packs at their position. Once the bottom most pack is pulled into the tray, other packs will fall down and next pack will be ready to get pull in. Refer Fig.47.

Ideation- Mechanism

Here the pushing action will be done by roller & belt system. The rollers will be calibrated according to the number of rotations required to deliver one pack. Refer Fig.48.

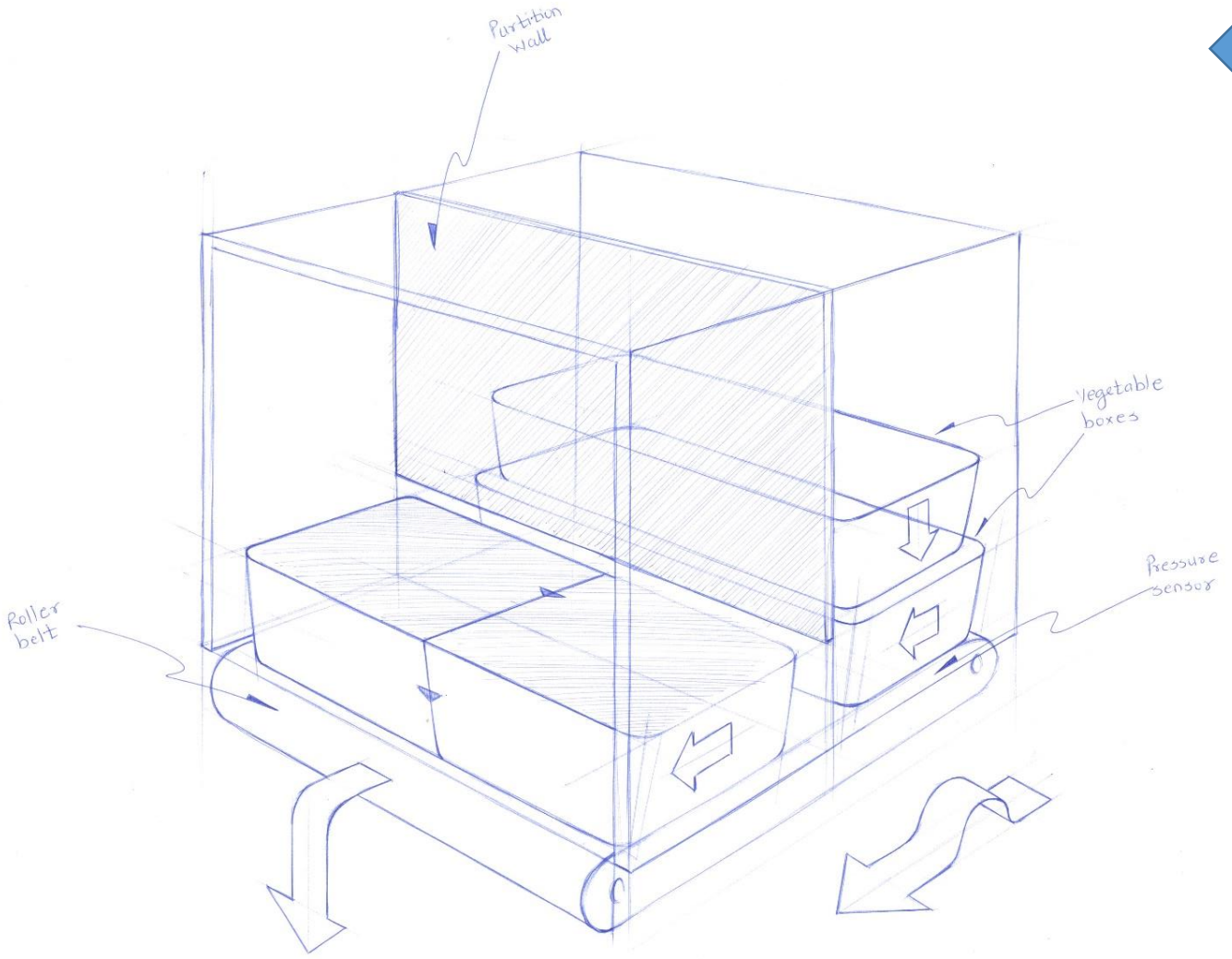


Fig.48: Ideation-Mechanism

Ideation- Mechanism

Here the robotic arm with suction cups will be used to lift the vegetable boxes. Refer Fig. 49.

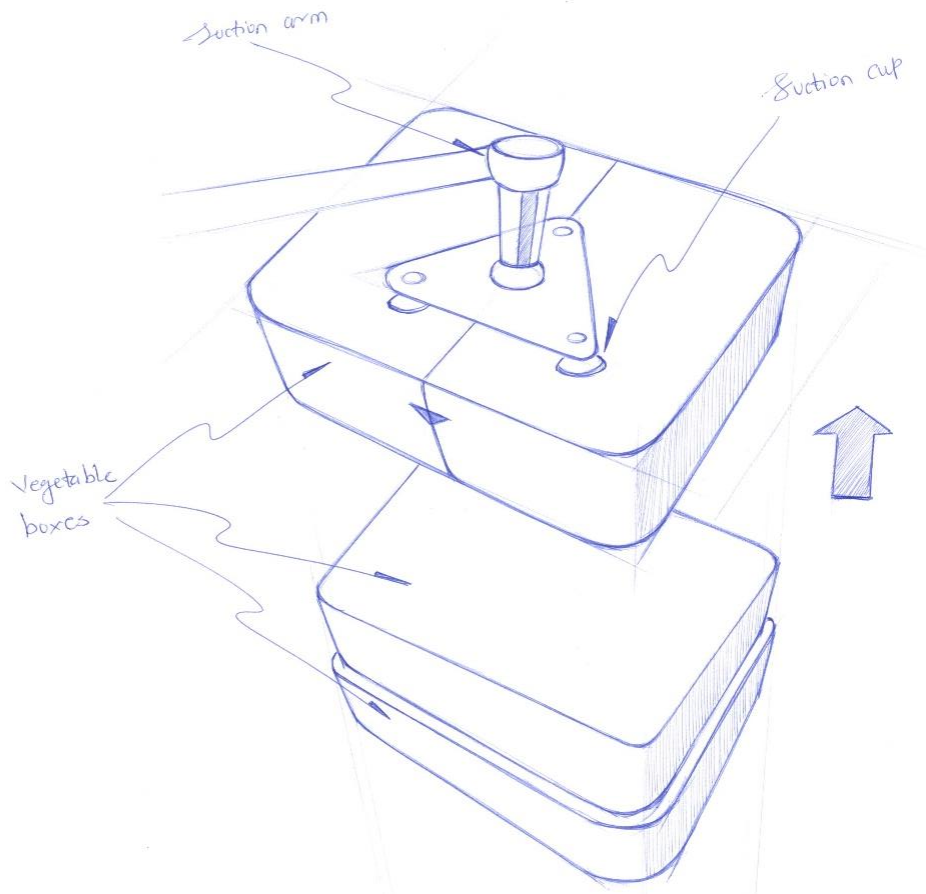


Fig.49: Ideation-Mechanism

Ideation- Mechanism

Here, a special laser pointer will be used to select vegetables . Refer Fig. 50

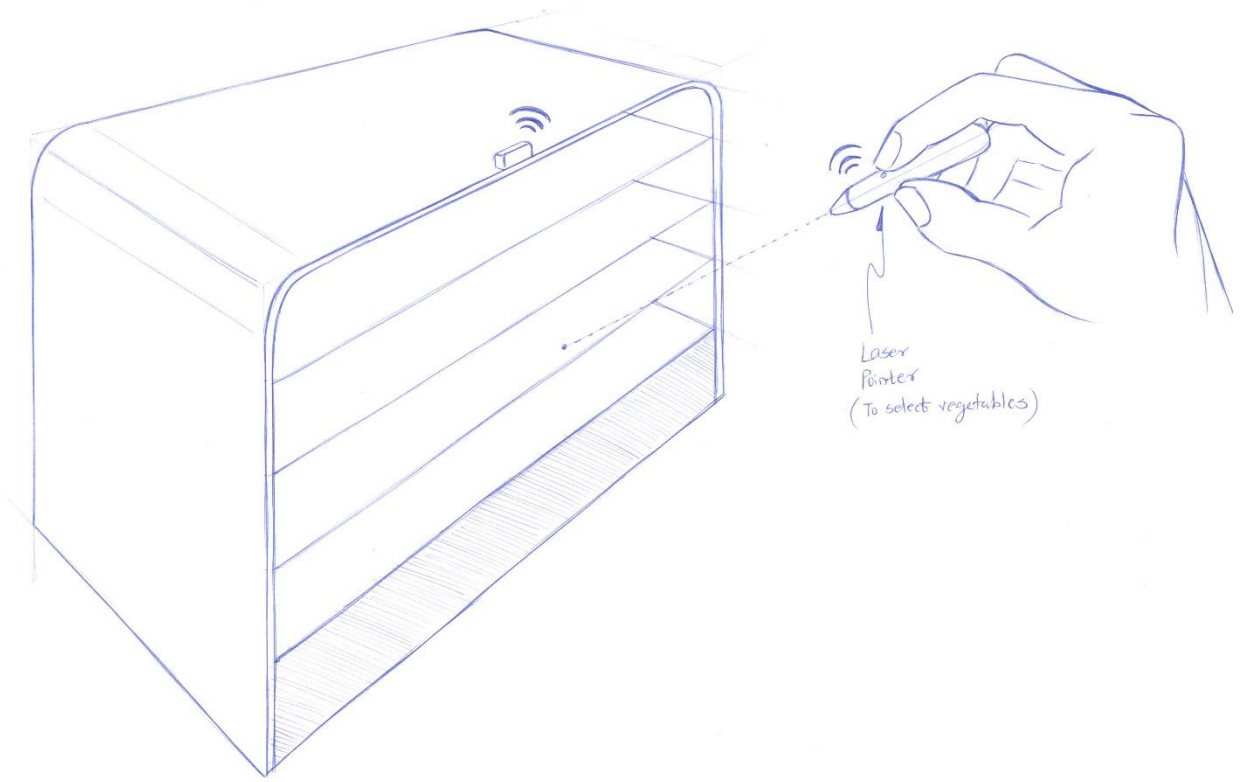


Fig.50: Ideation-Mechanism

Ideation- Mechanism

Here, a spring operated one sided hook will be used to pull vegetable box out from the stack. Here the vegetable boxes will be stacked in inclined manner. As the center of gravity of all the boxes are away from the line of contact with the lower most box, the net weight acting on the lower most box will be less. It will help the hook to pull the box more easily out of the stack. Refer Fig.51.

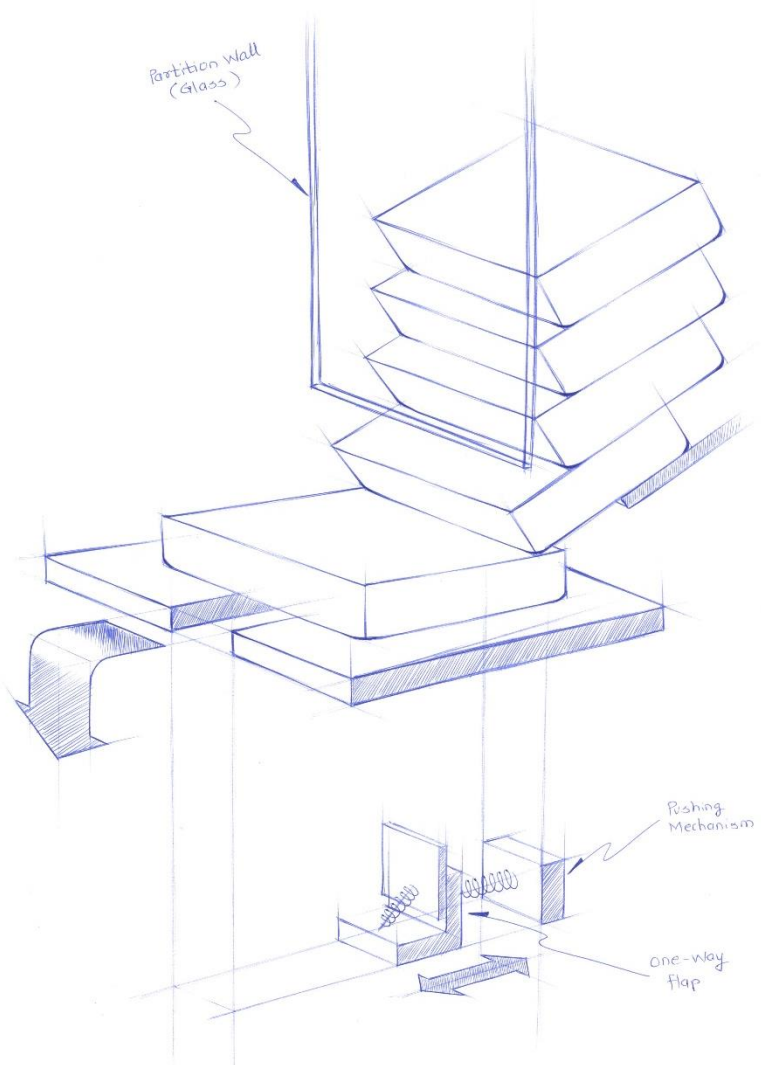


Fig.51: Ideation-Mechanism

Final Mechanism

After comparing all these mechanisms on the criteria of feasibility, usability, energy consumption, complexity & necessity the 1st mechanism with helical coil was selected. Refer Fig.52.

As, it is more simple in working, with good efficiency, less moving parts, easy to clean & easy to maintain.

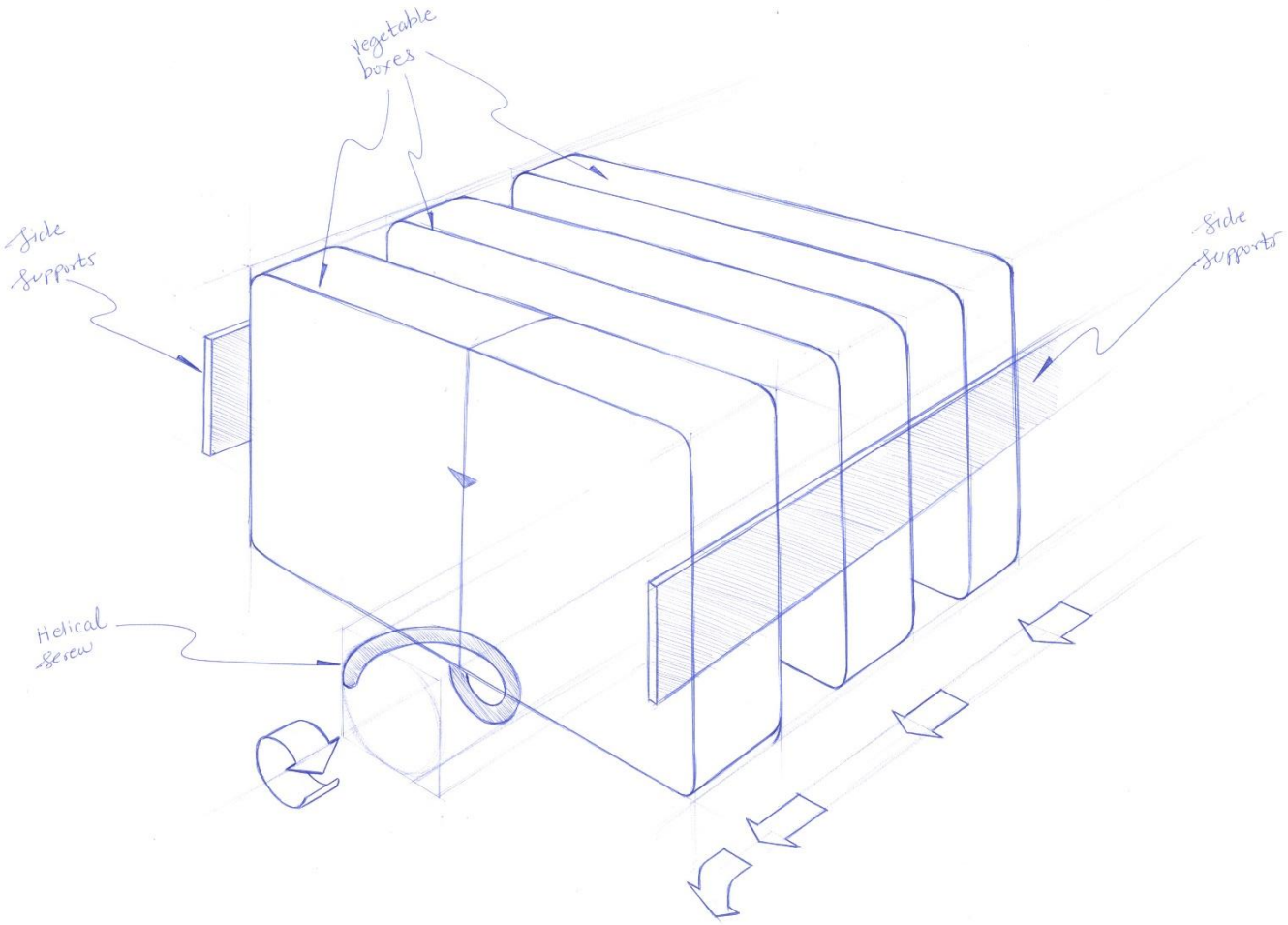


Fig.52: Final mechanism

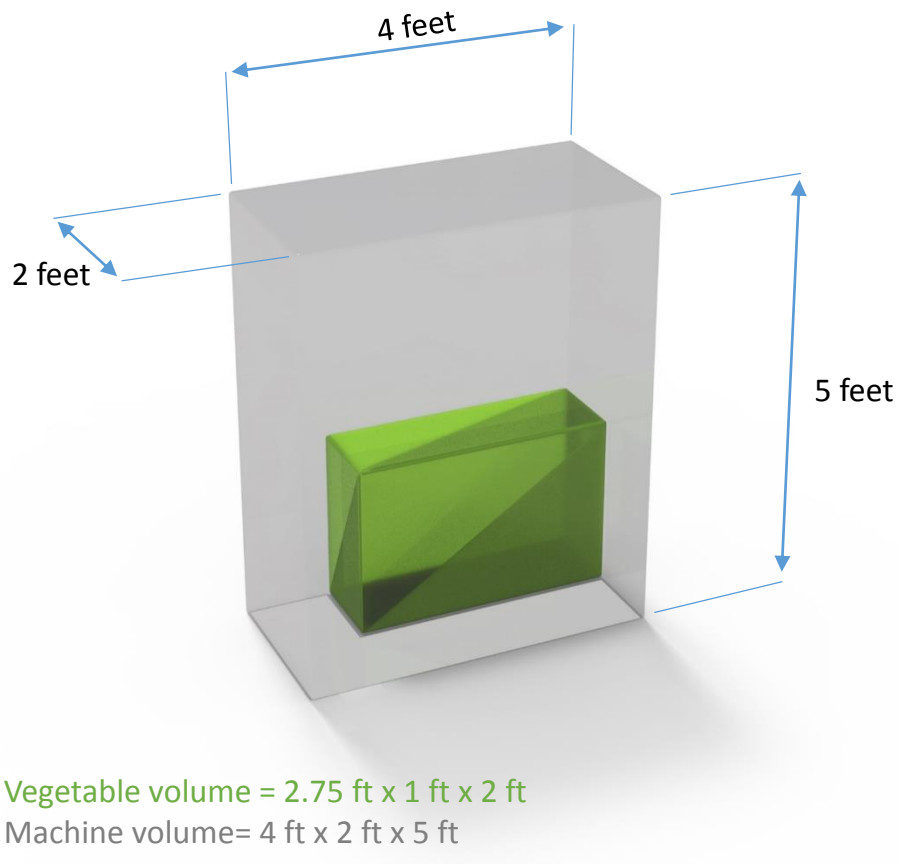


Fig.53: Approximate dimensions of vending machine

Refrigeration

Total volume of vegetables to be kept in vending machine at a time is 115 cubic decimeters. i.e. 115 liters (approx.) Refer Fig.53.
It was decided to use standard vapor compression refrigeration system.

Hence the refrigeration unit necessary for the system should be of capacity slightly more than required one. The standard refrigeration system with 150 liters was chosen and the dimensions of its components was measured.

Compressor- l= 9 inches, b= 9 inches, h= 9 inches
Condenser- l= 2 feet, b= 1.5 feet, h= 1.5 feet
Evaporator- l= 3 feet, b= 1 feet, h= 4 feet

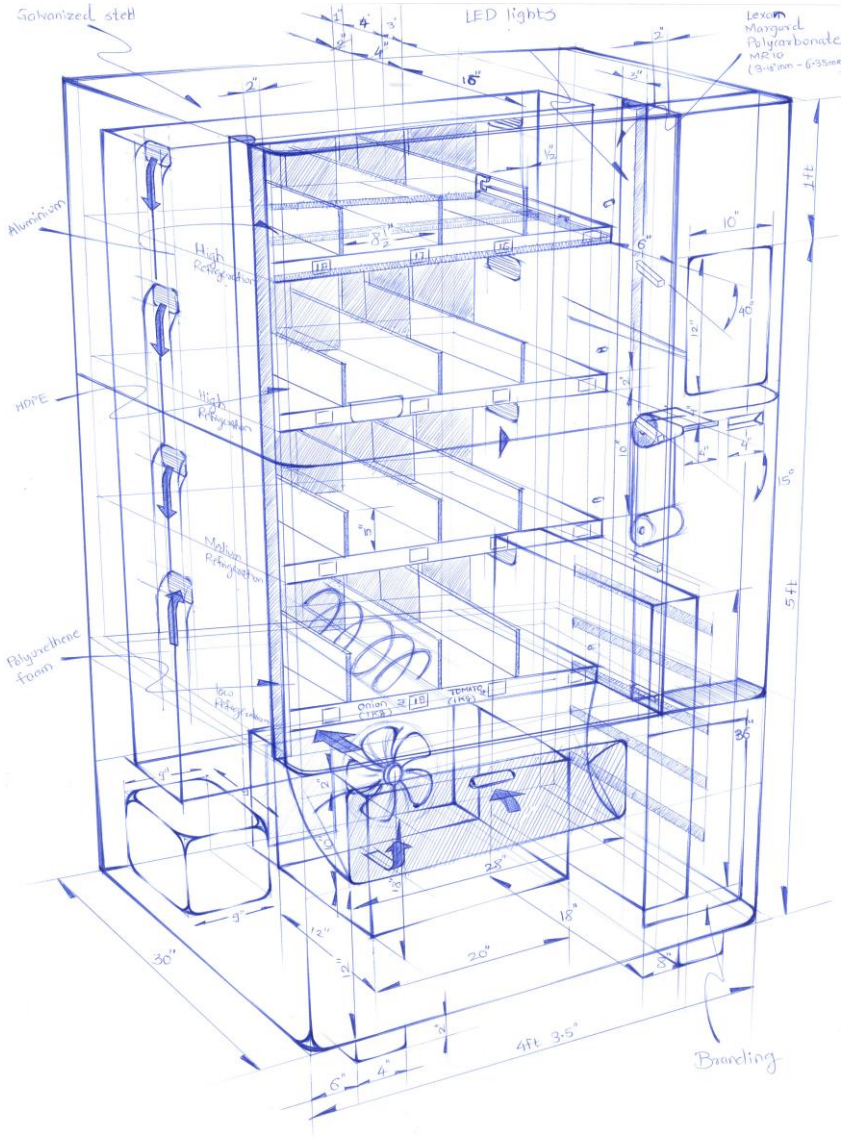


Fig.54: Detailed drawing of the vending machine

Detailing

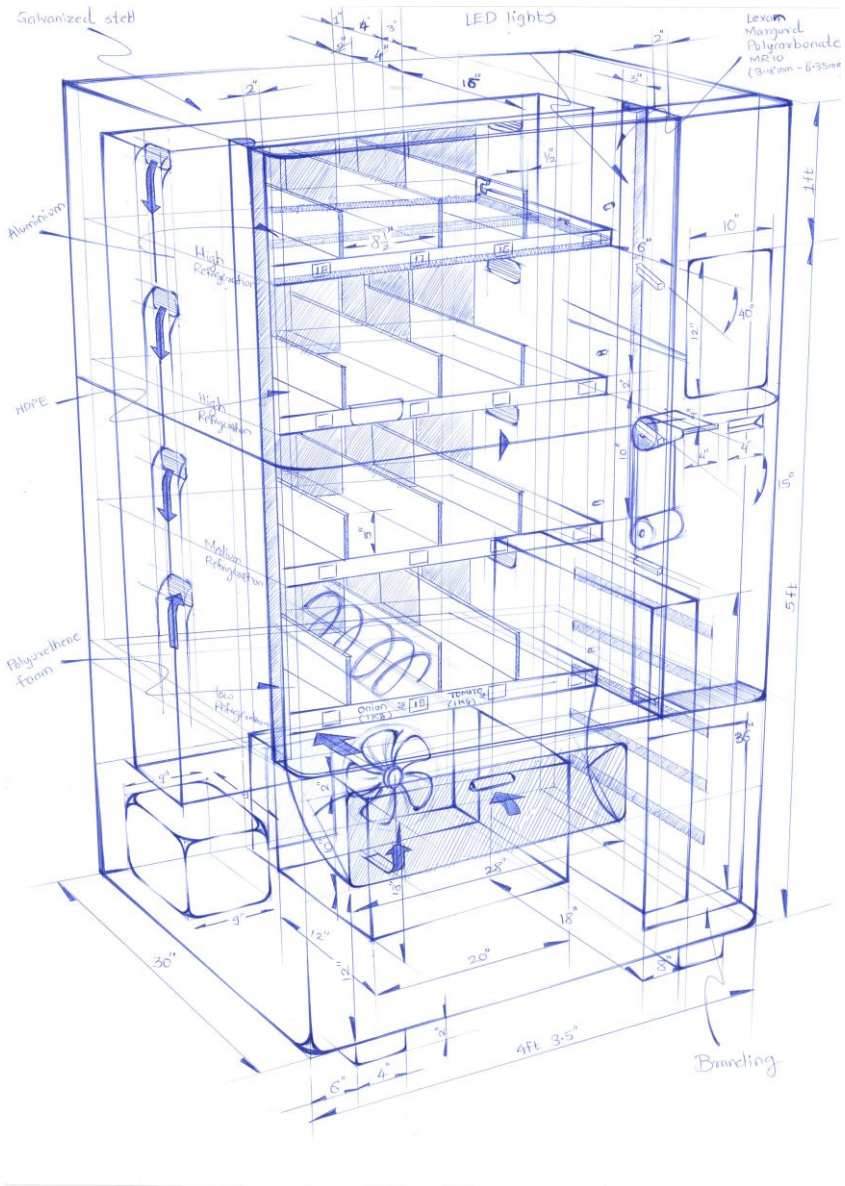
By considering all the dimensions of the required components and the mechanism used in the machine, a detailed drawing of vending machine was made. Refer Fig.54.

Refrigeration system

Refrigeration system will be installed at the bottom & back side of the vending machine. Compressor & condenser will be installed at the bottom of the machine. Condenser fan will be installed on the back door of machine. Evaporator will be installed on the back side of the vending machine. A separate door will be provided on the back side for the maintenance of the evaporator, condenser & compressor.

In traditional domestic refrigerators, the cooled air is provided at the top. As it is heavier than hot hair, it goes at the bottom of refrigerator. While going down, it absorbs heat and becomes hot. Its weight decreases and it again moves up. So, this cycle continuous and the entire temperature inside the refrigerator reaches to a predetermined constant temperature.

But some vegetables like onion & potato don't require refrigeration. Some vegetavles like methi, coriander, curry leaves require slightly more refrigeration. While some vegetables like capsicum, bringer, chilly, gawar require more refrigeration. And some vegetables like mushroom & cauliflower require high amount of refrigeration. Hence traditional coolong method can not be used in vegetable vending machine.

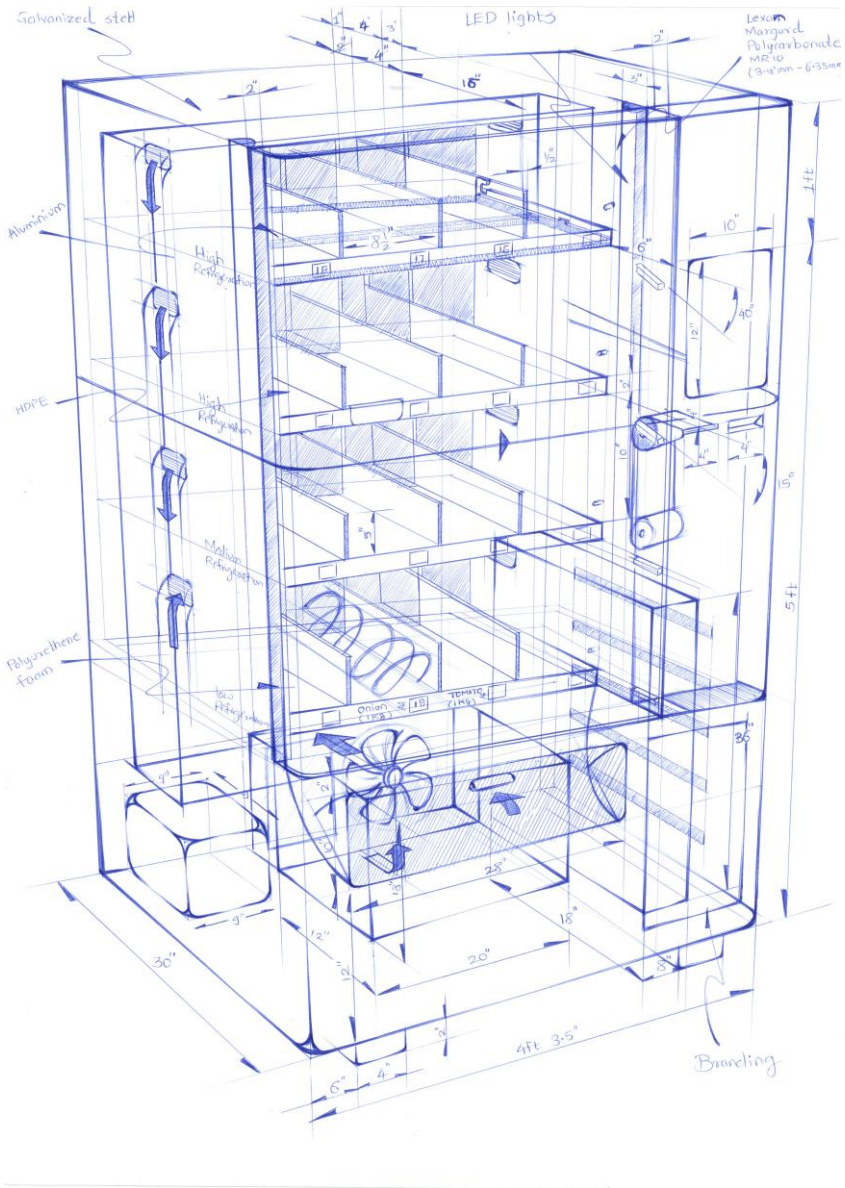


Hence, in this vending machine, cold air will be provided at the bottom of the vending machine. So as it is already heavy, it will remain at the bottom part only. Only very few portion will reach the upper compartment. Hence the upper compartment can be maintain at relatively higher temperature. So, a constant gradient can be achieved in the vending machine. Vegetables will be kept according to refrigeration required.

Outer & inner casing

The outer casing of the vending machine will be made up of Galvanized steel which will be powder coated to avoid it getting damage by transportation damage, Sunlight and human abuse.

The inner structure which gives support to trays is made up of Aluminium. And the trays will be made up of HDPE. [HDPE does not release toxins / chemicals into the substance into contact with it.] Also the inner casing will also be made up of HDPE. Insulation will be provided by introducing Polyurethane foam in between outer steel casing & inner HDPE casing. PU foam acts as an insulator as well as it gives structural rigidity to the machine.



Tray system

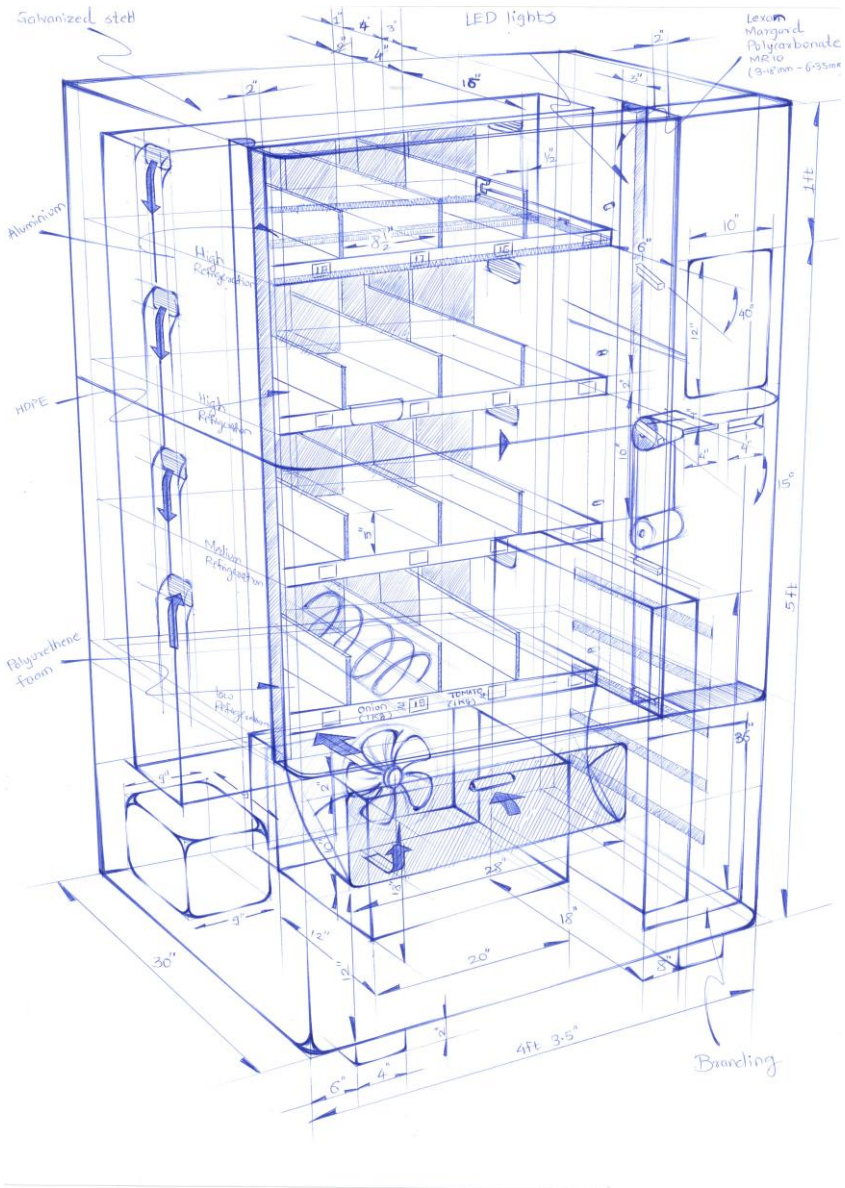
The trays will be resting on the aluminium frame. At the time of refilling the trays, the trays can be lifted up and slide out of the vending machine. At the end of each tray there is a hook which will get hooked with a node fixed on the outer side of inner frame. So, it will avoid tray from coming entirely out. Also an inclined resting pad will be provided below the hook so that, the upper trays can be opened in some inclination; which will provide refill person better accessibility to inner trays. This inclination angle will be more [40^{o}] for upper most tray. Then it will be low [15^{o}] for 2^{nd} tray. And then there wont be any inclination for the lower 3^{rd} & 4^{th} trays.

LED display

LED screen will be provided on the right hand side of the machine. Card swipe mechanism & printed bill dispensing mechanism will be installed below it.

Branding area

Dedicated area will be provided on the lower right corner of the vending machine for the branding of the company.



Dispensing chamber

The dropped vegetable boxes will fall on the inclined LDPE film which will absorb the shock and avoid vegetables from getting damaged. These vegetables can be collected through the opening at the bottom of vending machine. This chamber will have two motion sensors on both sides to ensure the delivery of the ordered item.

Vegetable order

Vegetables will be arranged on the rack according to the amount of refrigeration required & the hardness of the vegetables. E.g. Tomato require moderate amount of refrigeration; but it is very soft and delicate. So, tomato boxes will be kept on the lower most rack of the vending machine.

Potato	Onion	Pumkin	Drumstick
Methi	Coriander	Cucumber	Curry leaves
Chilly	Gawar	Bringer	Bhandi
Mushroom	Tomato	Cauliflower	Capsicum

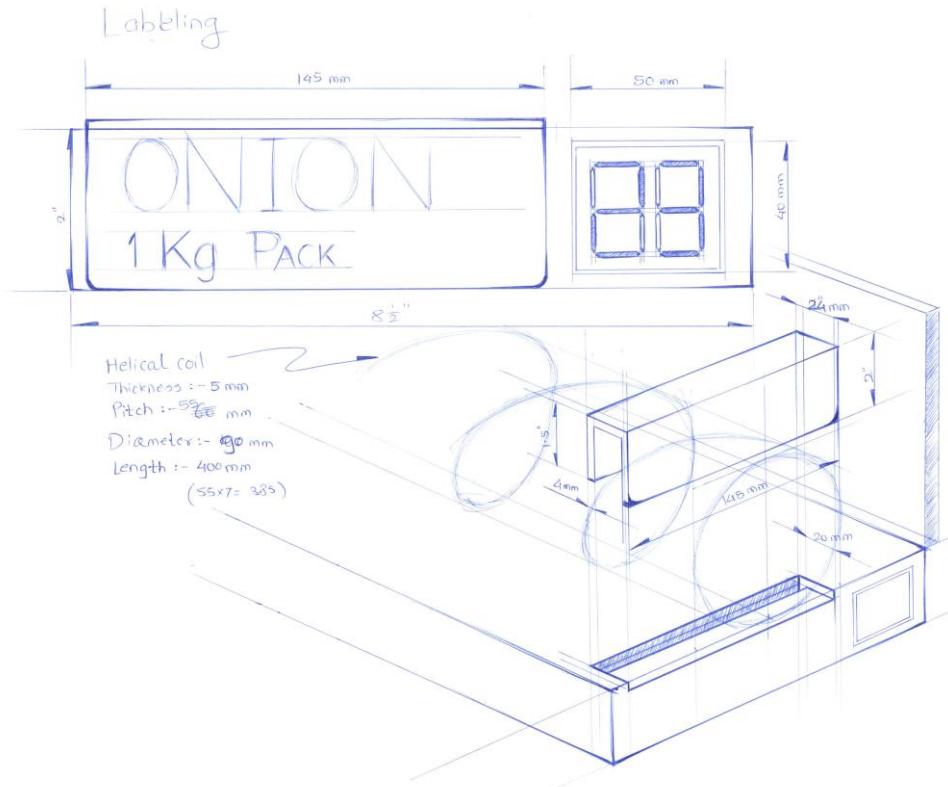


Fig.55: Labeling system

Illumination

A LED light source will be provided on the either side of the door along the height of the frame.

Labeling

The labeling will be done as shown in the Fig.55. The name and the net weight of vegetable will be written on the separate plate which can be hung in to the slit provided in the compartment. The price of one box of each vegetable will be displayed separately near the name plate. It will be displayed by using standard LED numerical display.

Dispensing mechanism

As discussed earlier, the dispensing mechanism will be in the form of helical coil. The helical coil will be made up of stainless steel. The thickness of coil will be 5 mm while, its pitch will be 55 mm. The diameter of the coil will be 90 mm and its total length will be 400 mm.

Security

The door of the dispensing chamber will open inside with the hinge at the upper edge; so that thief's hand can not reach up to the rack of vending machines. Also one CCTV camera will be installed to cover front side of the vending machine.

Form

The adjectives which I chose for form of the vending machine are ‘ Elegant ’ & ‘ fresh ‘.

So, 1st the product category space was prepared (Refer Fig. 56). Then extended category space was explored (Refer Fig.57). Then mood board for adjectives ‘Elegant’ & ‘Fresh’ was prepared (Refer Fig.58 & 59).

Then the clues were taken from the mood board and the form exploration was made.

Product category space

1 2 3 4 5 6 7

8 9 10 11 12 13 14

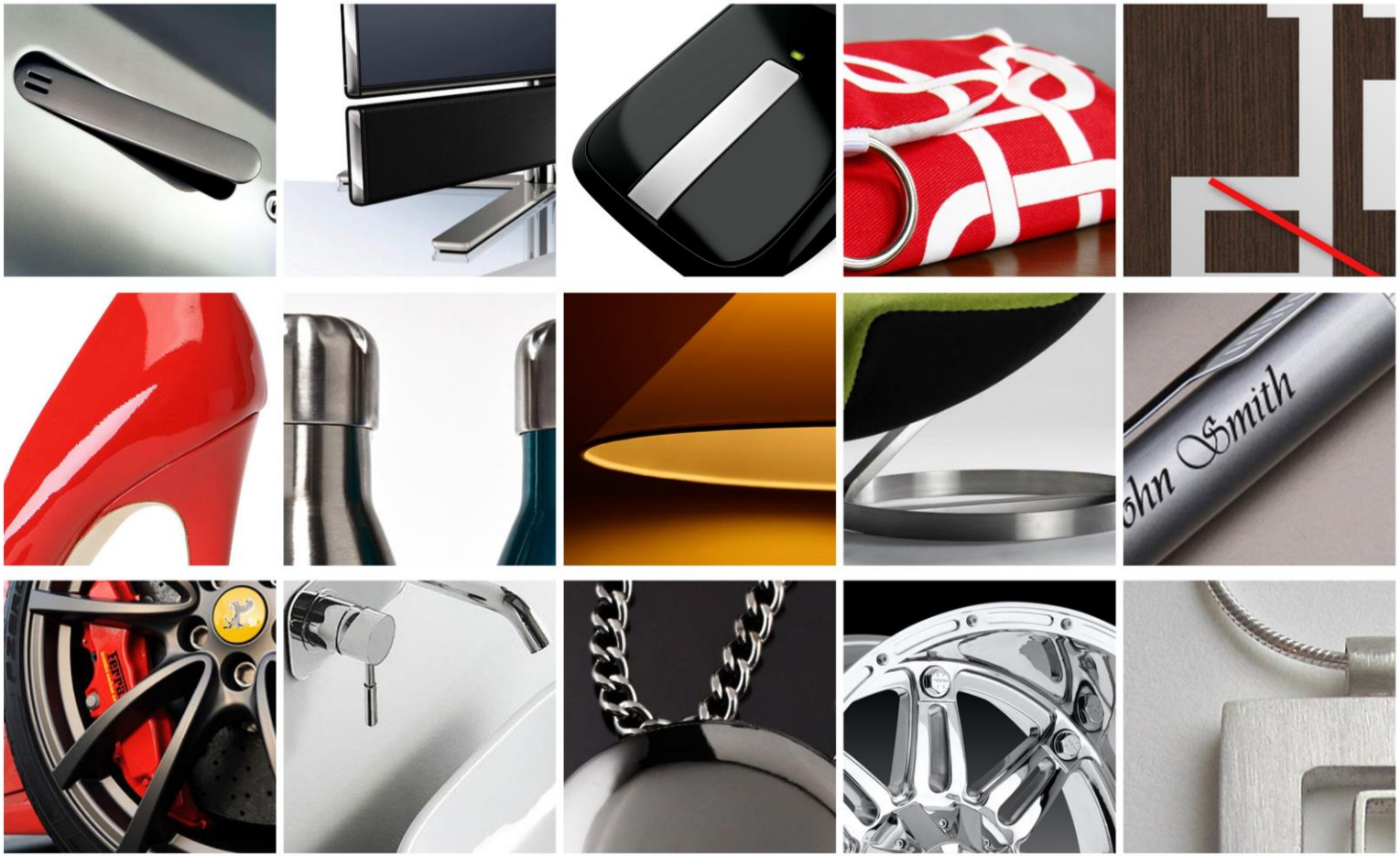
Fig.56: Product category space

Extended category space

Fig.57: Extended category space

Product expression

Elegant



- Smooth chamfer
- Long lines
- Contrast colour combination
- Shiny metallic finish
- Clear borders
- Clear gaps

Fig.58: Images depicting elegance

Product expression

Fresh

- Bright colours
- Orange / green
- Fine texture
- Matte finish
- Supper gloss
- Fine details
- 2 colour scheme

Fig.59: Images depicting freshness

Form explorations

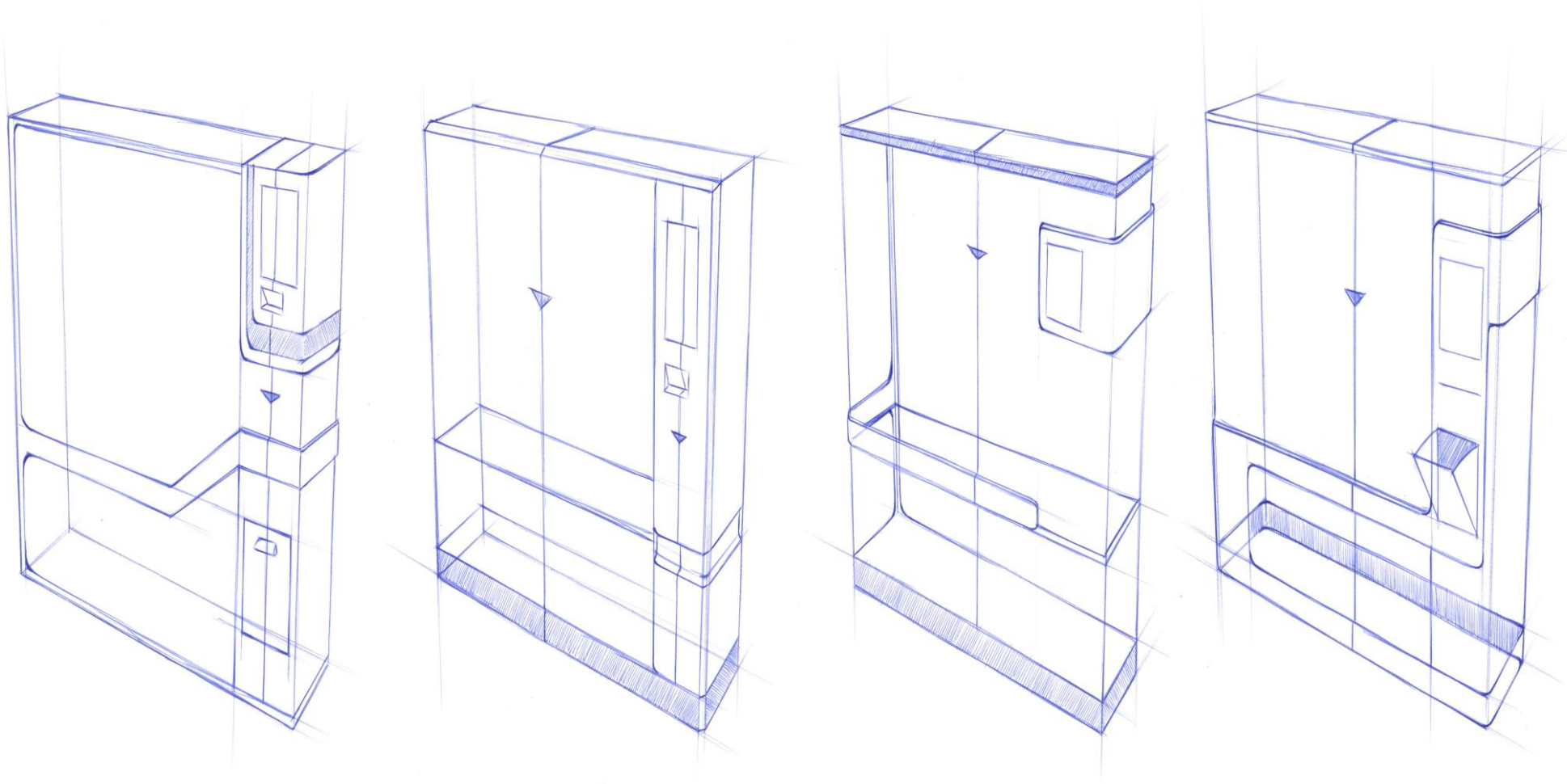


Fig.60: Form explorations

Form explorations

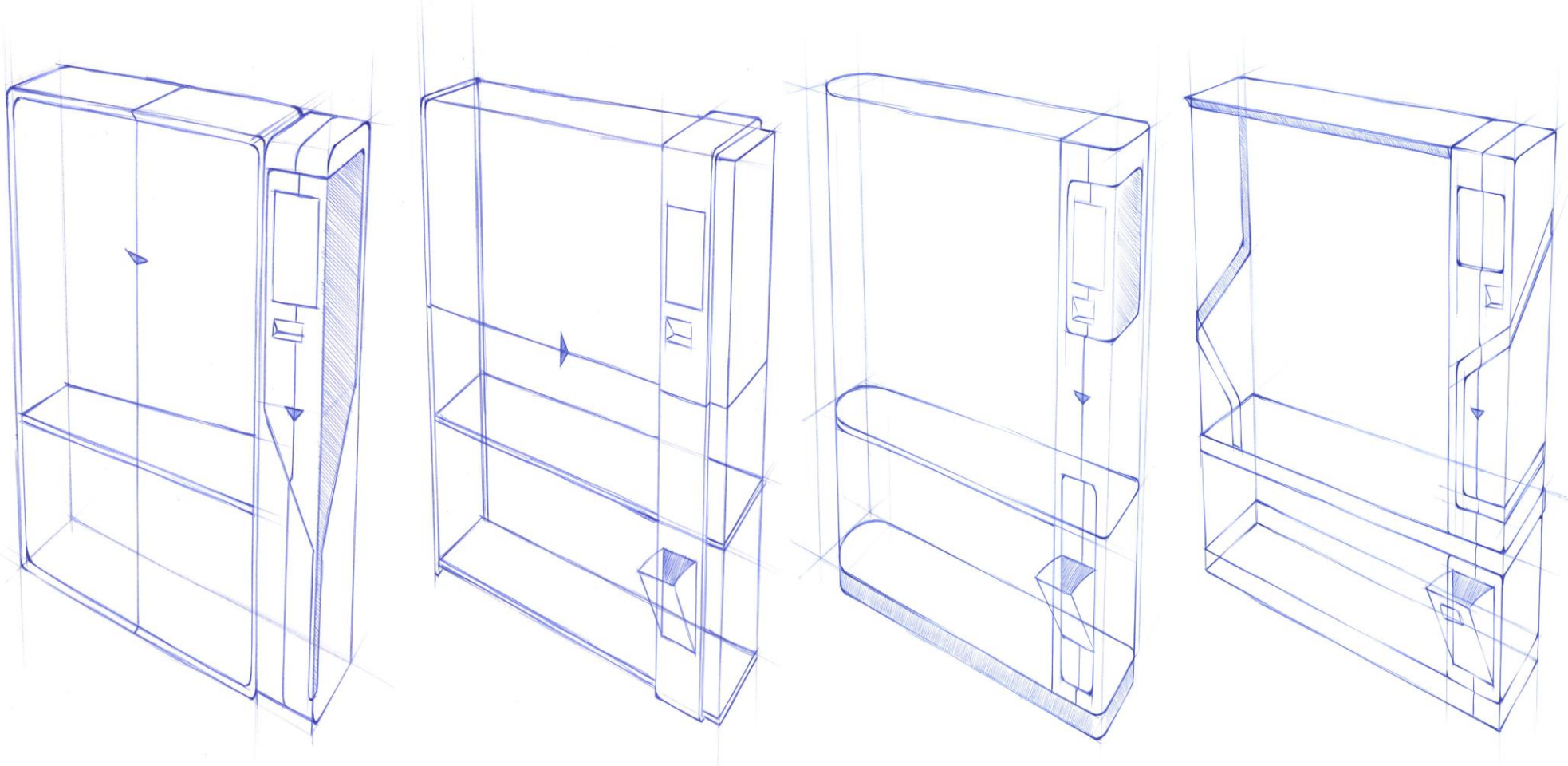


Fig.61: Form explorations

Form Evaluation

Interface

The stakeholders can be divided into two categories
Primary stake holders- Service person
Customer
Secondary stakeholders- Maintenance person
Central system operator (admin)

- Service person-
  This is a person who will refill the vending machine

- Customer-
  This is a person who will buy vegetables from vending machine

- Maintenance person-
  This is a person who will do monthly maintenance of all the vending machines in its working area

- Central system operator (Admin)-
  This is a person who will be sitting in the main office of the company. He will take care of all the statistical part of vending machine. Also he will find out empty vegetable compartments & ask service person to refill it.

Interface was made for Service person, Customer & admin

Interface

Activity analysis of Admin

1. Find out the number of vegetable boxes of each vegetable in each vending machine of his working area.
2. Find out expired vegetable boxes of each vending machine
3. Deciding total number of boxes of each vegetable for each vending machine
4. Taking print of data of refilling
5. Give this data to Service person

Interface

Activity analysis of Service person

1. Receives a information about empty / less vegetable boxes for each vending machine in his working area
2. Collects required vegetables from central storage unit
3. Opens vending machine by using special key / password
4. Checks the number of boxes of each vegetable
5. Refills the machine in proper manner
6. Closes vending machine door and locks it
7. Takes a trial
8. Sends notification to central unit about status

Interface

Activity analysis of Customer

1. Interacts with LED display
2. Takes a look of available vegetables, their weights & prices
3. Selects vegetables & number of packets to buy
4. Decides carry bag option
5. Swipes his card
6. Enters security code
7. Collects vegetables

Wireframe

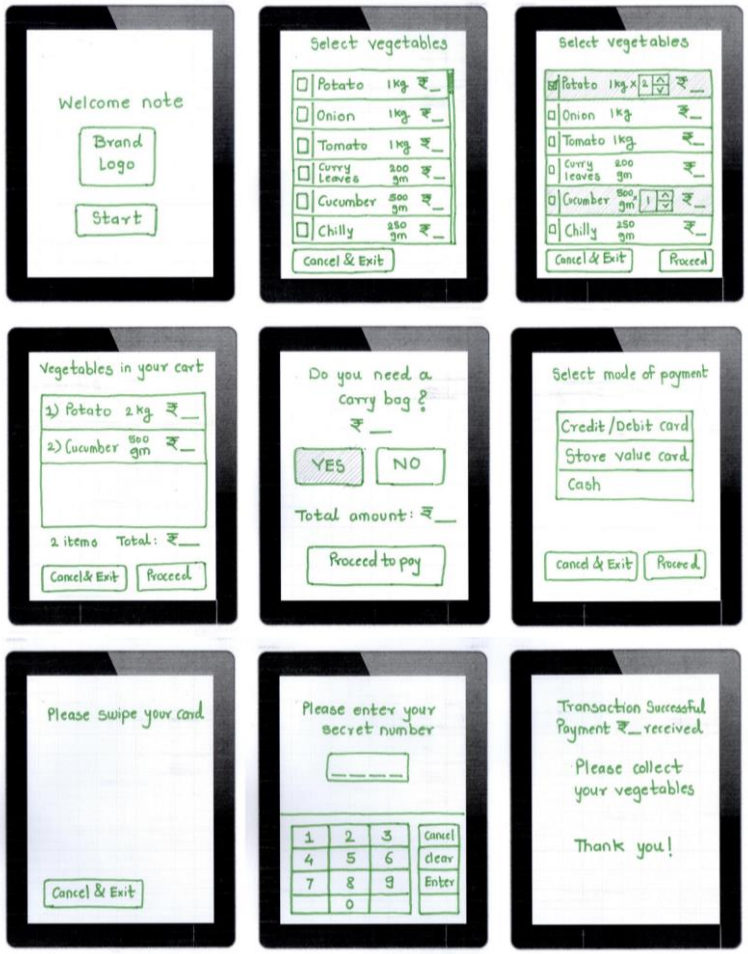


Fig.62: Interface wire-frame

Then the wireframe of interface screens for all the stake holders were made . Refer Fig.62. It helped me to find out loop holes in the entire system. Then these loop holes were solved out. Also approximate visual elements were figured out.

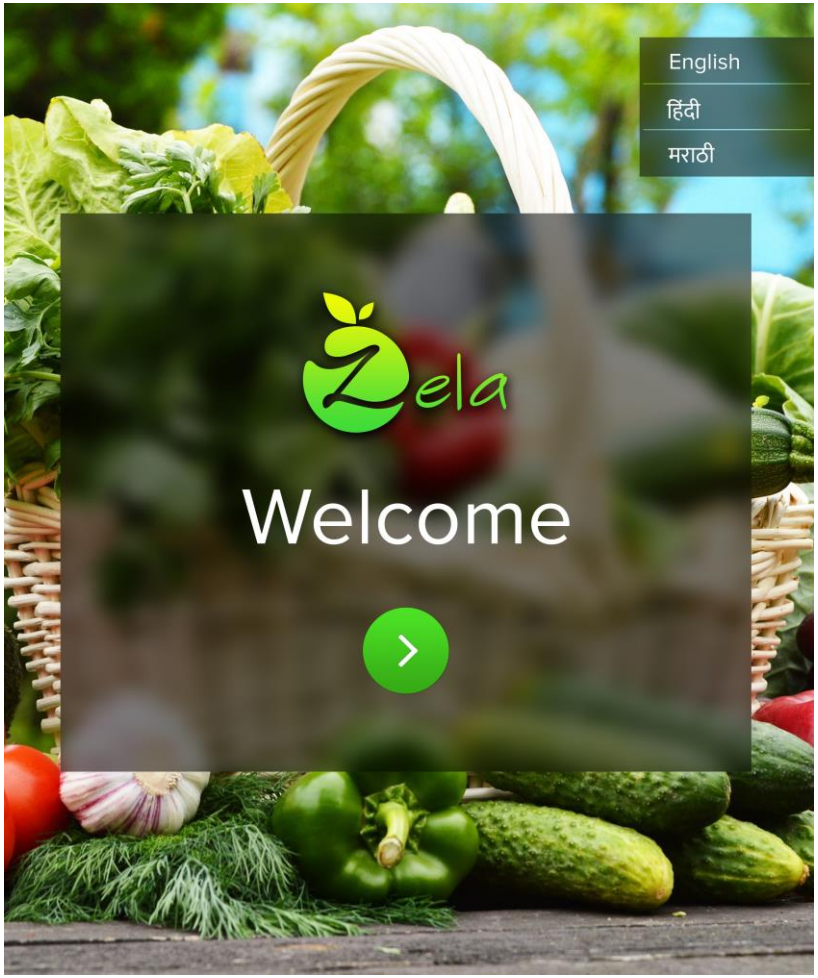


Fig.63: Final interface

Final visual interface

After evaluation the visual interface with blur background was finalized (Refer Fig. 63).

- Its background with light blue colour and fresh vegetables gives it a fresh look
- Also, the vegetables on the background help customer to easily relate product with vegetables.
- The foreground text was written over the background of blur, semi-transparent black rectangle. This kind of blurred background gives uniqueness to the interface. Also its helps to partially show the background vegetable picture to the customer without interfering with the text written over it.
- The font colour is chosen as white as it gives good contrast over the background blurred black rectangle.
- The font used is “Proxima Nova Rg” for English and “Ek mukta” for Devnagari type face.
- Font size of the word “welcome” is 72 pts; while the font size of the words “English, हिंदी and मराठी” is 20 pts.
- The icons used in the entire design are designed by considering minimalistic approach.

Admin

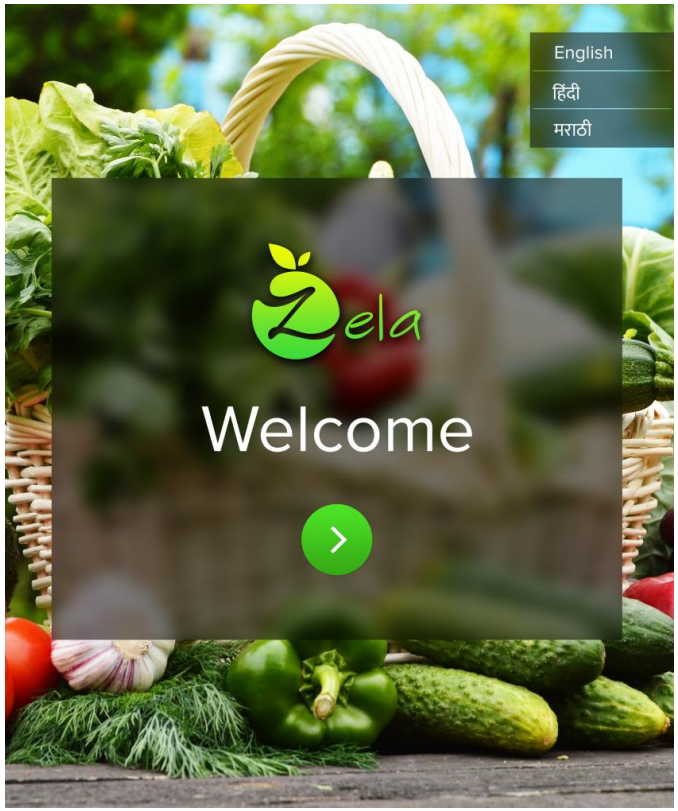


Fig.64: Interface- Admin

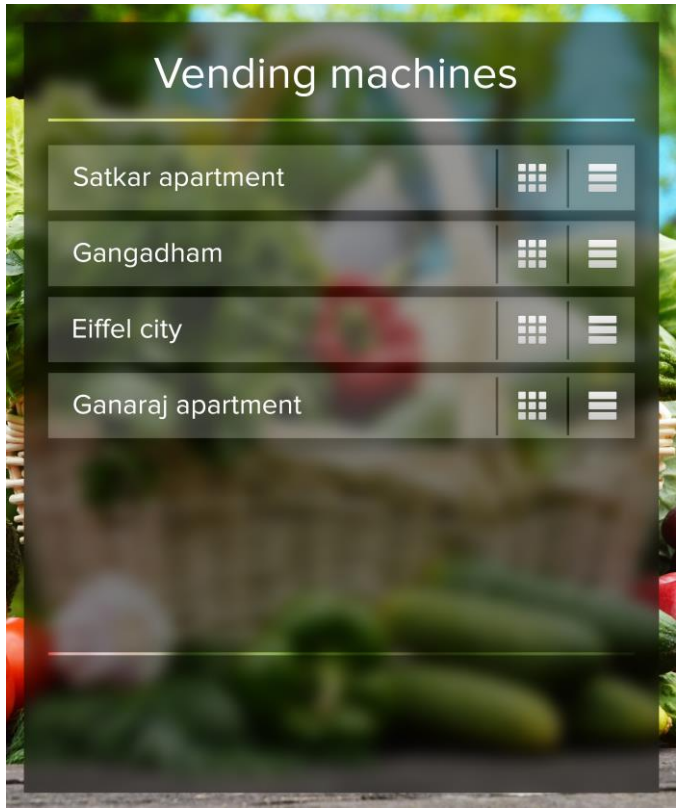


Fig.65: Interface- Admin

Fig.64 shows the welcome screen of the admin.

After clicking on the “next” button, screen as shown in Fig.65 will come. Here the admin person can see the list of all the vending machines in his working area. Vending machines will be named after the society / apartment. There will be two icons in front of each society name. First is for grid view and the second is for list view.

Admin

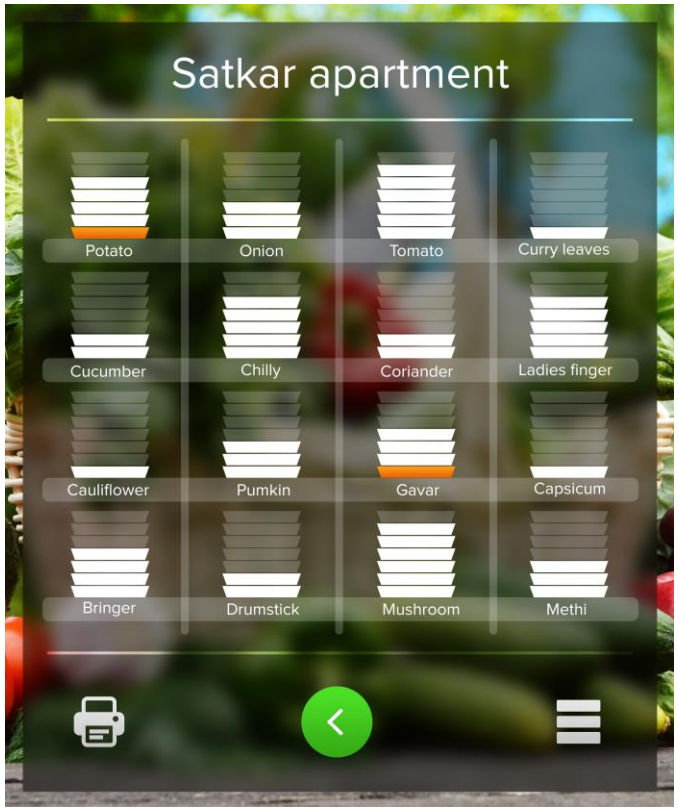


Fig.66: Interface- Admin

No	Vegetable	Available	Empty	Expired	Total
1	Potato	5	2	1	3
2	Onion	3	4	0	4
3	Tomato	6	1	0	1
4	Curry leaves	1	6	0	6
5	Cucumber	2	5	0	5
6	Chilly	5	2	0	2
7	Coriander	2	5	0	5
8	Ladies finger	5	2	0	2
9	Cauliflower	1	6	0	6
10	Pumkin	3	4	0	4
11	Gavar	4	3	1	4
12	Capsicum	1	6	0	6
13	Bringer	4	3	0	3
14	Drumstick	2	5	0	5
15	Mushroom	6	1	0	1
16	Methi	3	4	0	4

Fig.67: Interface- Admin

Fig.66 shows the grid view of that vending machine compartments.
Fig.67 shows the list view of that vending machine compartments.

Both screens will have back option at the bottom. Also there will be switch button option to switch between the grid view & list view.

In grid view, The white boxes show the available boxes, the transparent white boxes show the empty slots while he orange boxes show the expired boxes.

Also there will be print button to print the page for reference to the service person.

Service person

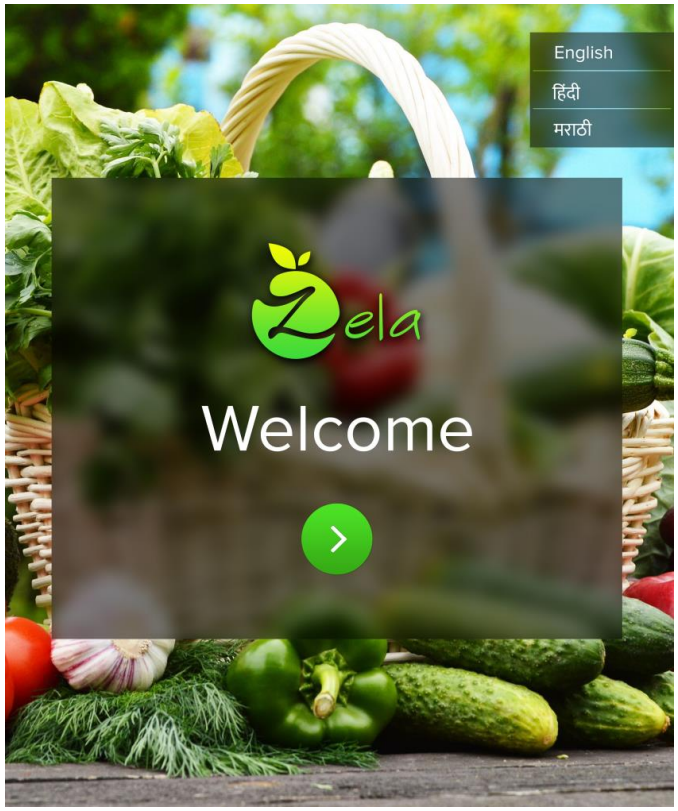


Fig.68: Interface- Service person

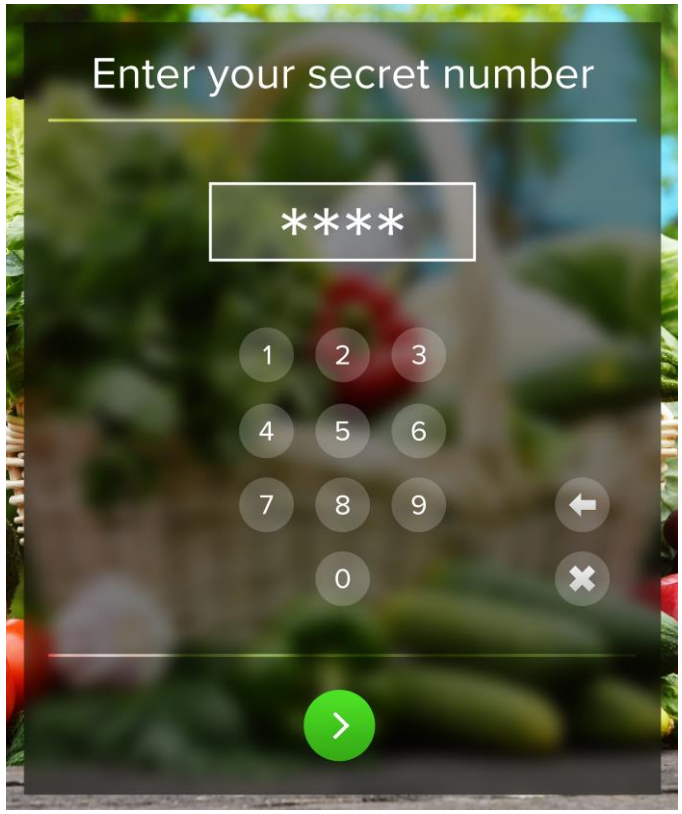


Fig.69: Interface- Service person

Fig.68 shows the welcome screen for the service person. Once he swipe his card, the screen as shown in Fig.69 will get opened. He will put the security code by using the number pad provided on the screen.

Service person

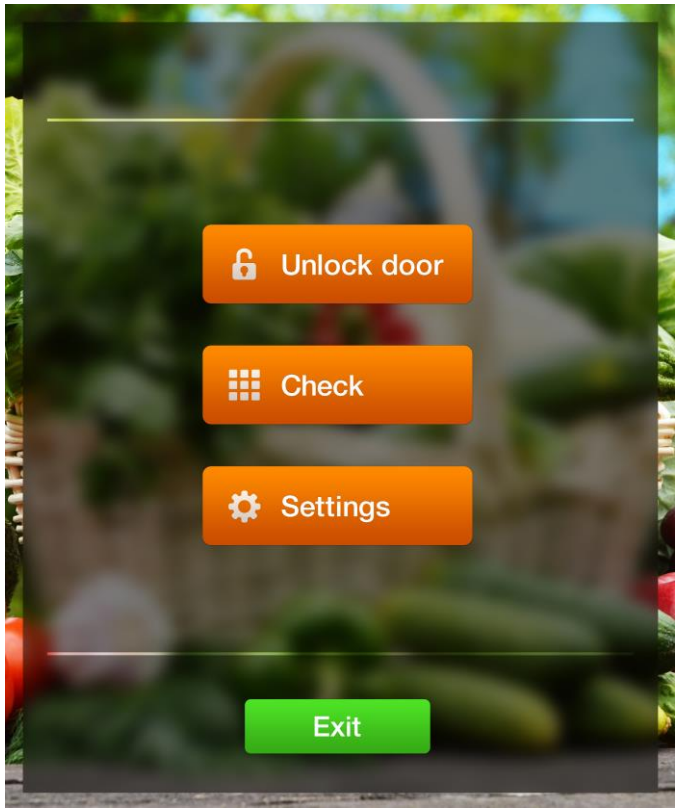


Fig.70: Interface- Service person

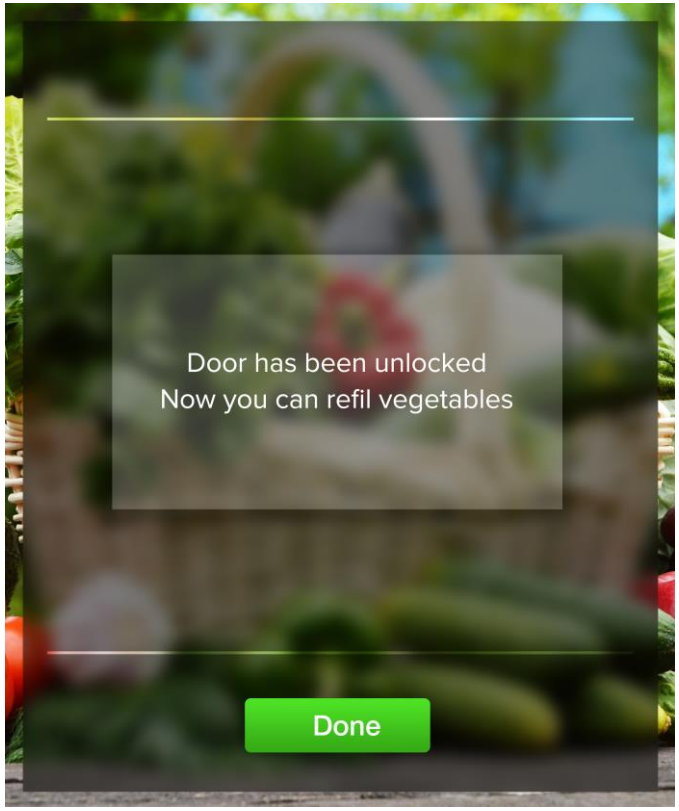


Fig.71: Interface- Service person

Fig.70 shows the menu screen. Here the customer can see the availability of vegetable boxes in each compartment by selecting the “check” option. He can unlock the door of vending machine by selecting the “Unlock door” option. Also he can change the settings of the machine by selecting “setting” option.

Once he select the “Unlock door” option, the screen as shown in Fig.71 will be opened. Then the service person will refill the machine with fresh vegetable boxes. Also he will replace the expired vegetable boxes with fresh ones. Then he will press “Done”.

Service person

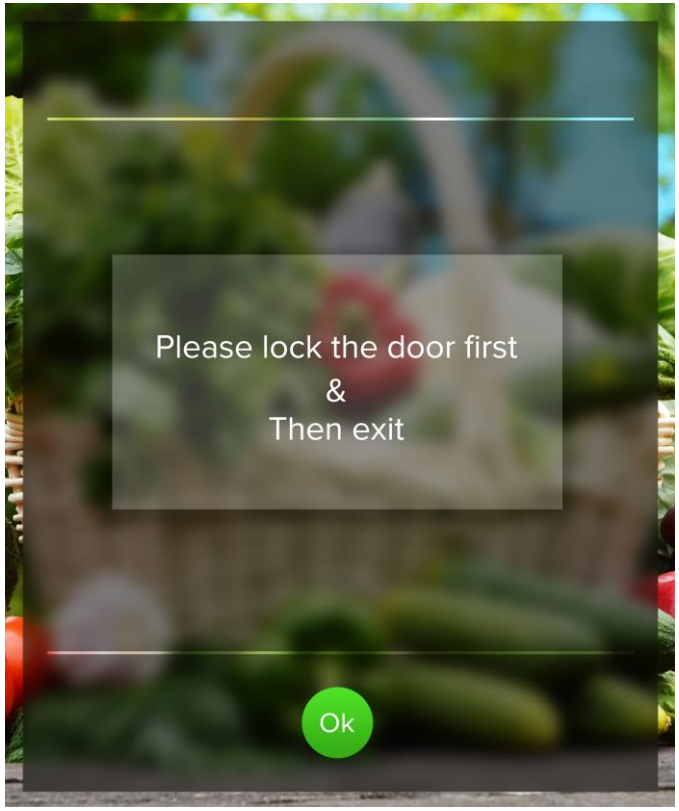


Fig.72: Interface- Service person

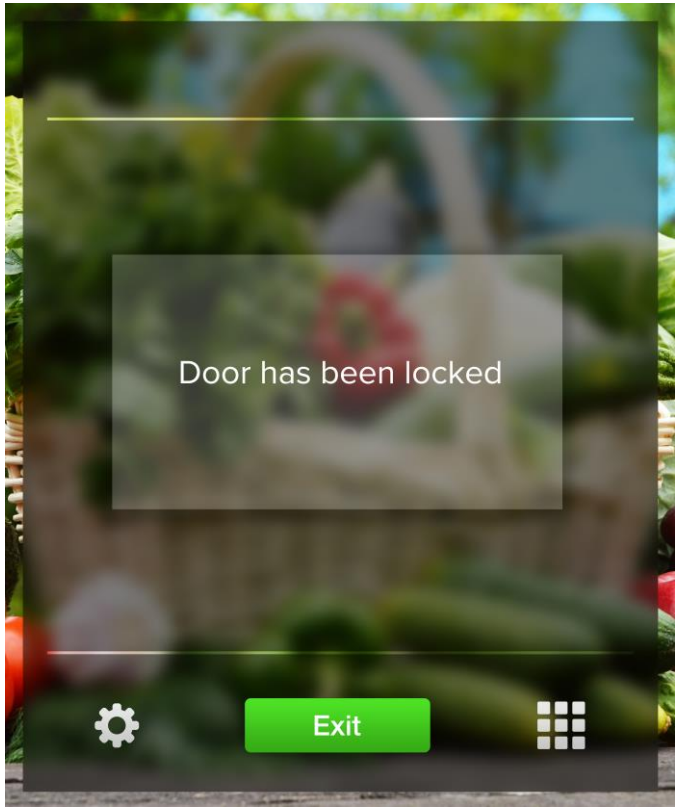


Fig.73: Interface- Service person

If the service person, forgot to lock the door 1st and if he directly selects “Exit” option form Fig.70, then a screen as shown in Fig.72 will get opened. It will ask the person to lock the door 1st & then Exit.

Once the door has been locked, an “Exit” option will appear at the bottom as shown in Fig.73.

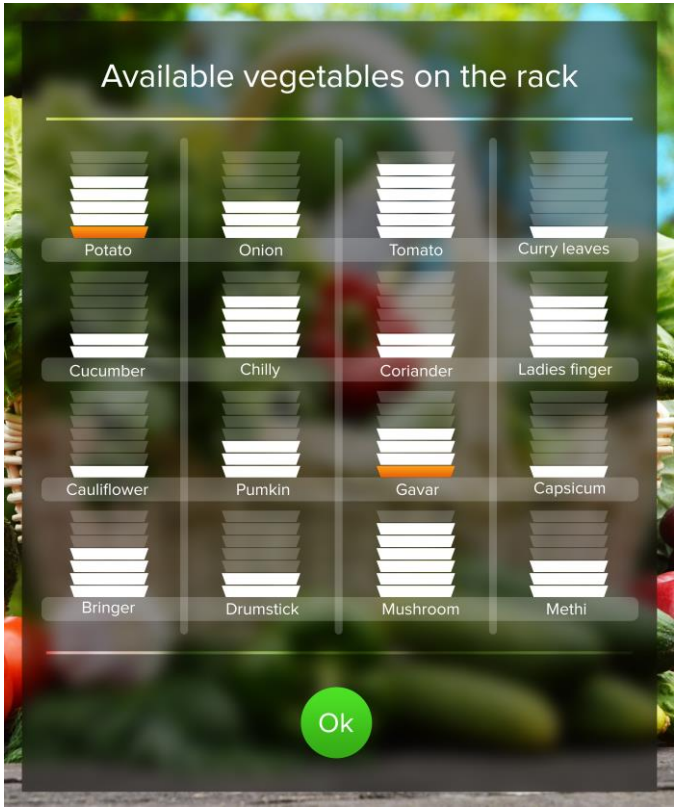


Fig.74: Interface- Service person

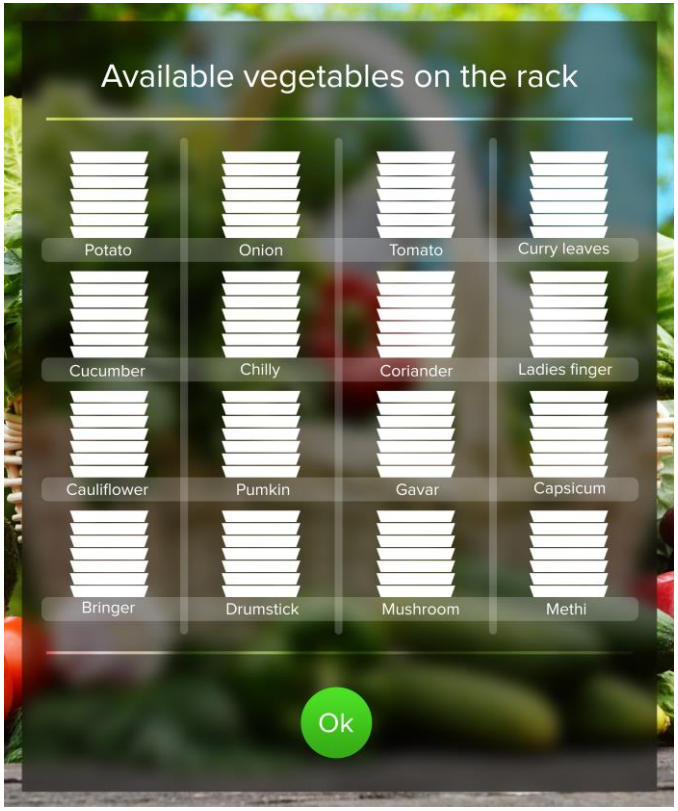


Fig.75: Interface- Service person

Service person

When the service person selects the “Check” option from Fig.70, the screen as shown in Fig.74 will be opened. It will give information about the total number of available boxes, total number of empty boxes & the total number of expired boxes.

Once all the empty slots are filled, and the expired boxes are replaced, the service person will press “Done” button from the Fig.71. then again if he click on the “Check” menu, then the screen as shown in Fig.75 will get opened.

Customer

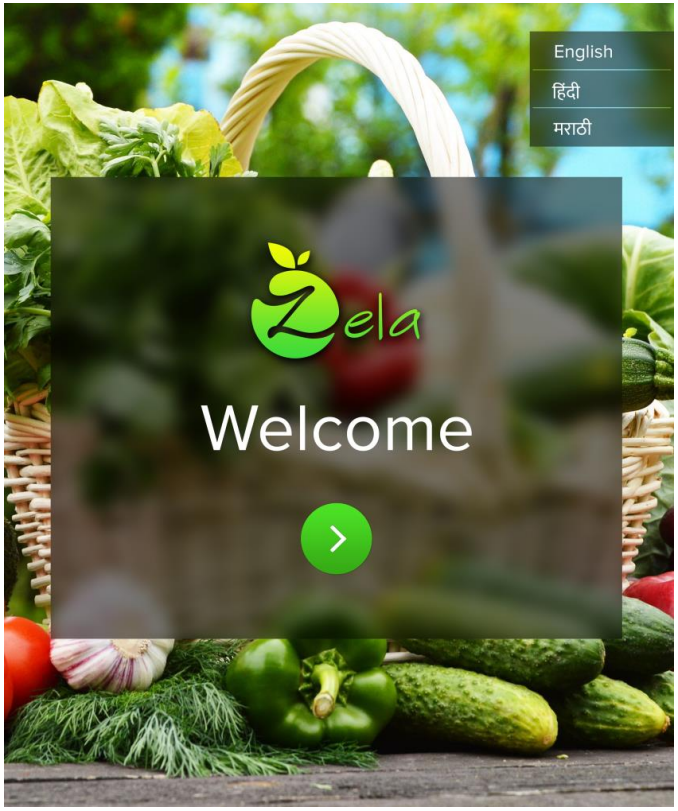


Fig.76: Interface- Customer

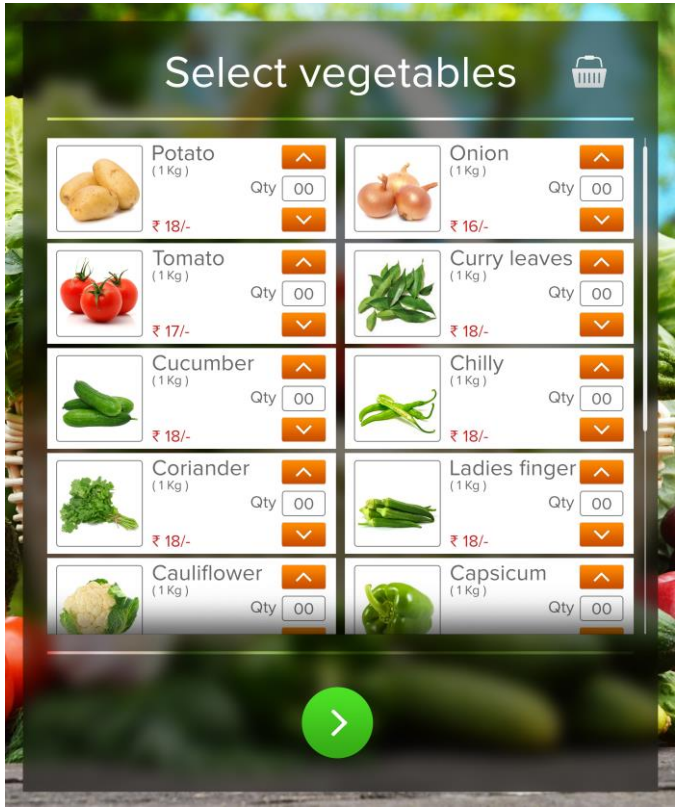


Fig.77: Interface- Customer

Fig.76 shows the Welcome screen for the customer. Customer can select the language of interface by clicking on the language options- “English, हिंदी and मराठी”.

Once he press “next” icon, the screen as shown in Fig.77 will get opened.
Here, all the vegetables available on the rack will be listed over the white background. The list will display vegetable name, picture, Weight of each pack, Price of each pack and option for selecting number of packets.

The basket icon on the upper right corner will display the number of types of vegetables the customer has selected.

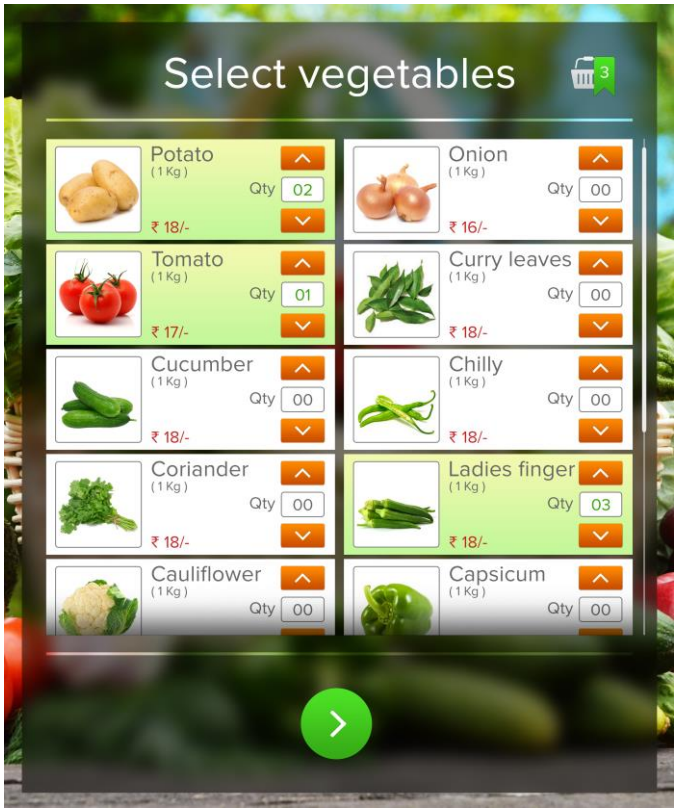


Fig.78: Interface- Customer

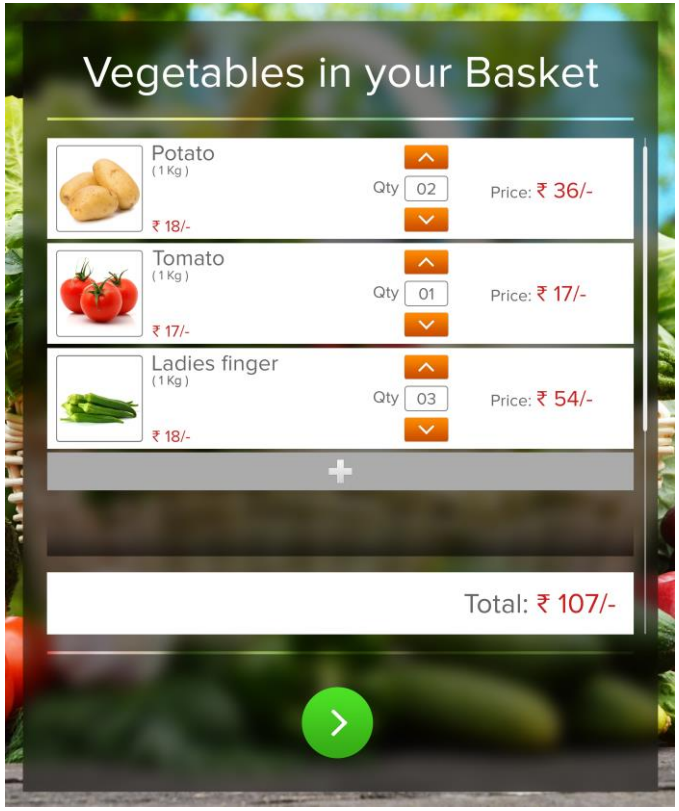


Fig.79: Interface- Customer

Customer

Once the customer select any vegetable & its number of packets to buy, the colour of that vegetable will get changed to yellowish-green gradient as shown in Fig.78.

Once he selects next option, the vegetables in the basket of customer will be displayed. Refer Fig.79. There will be a “+” option at the bottom of the list to add new more vegetables in the list.

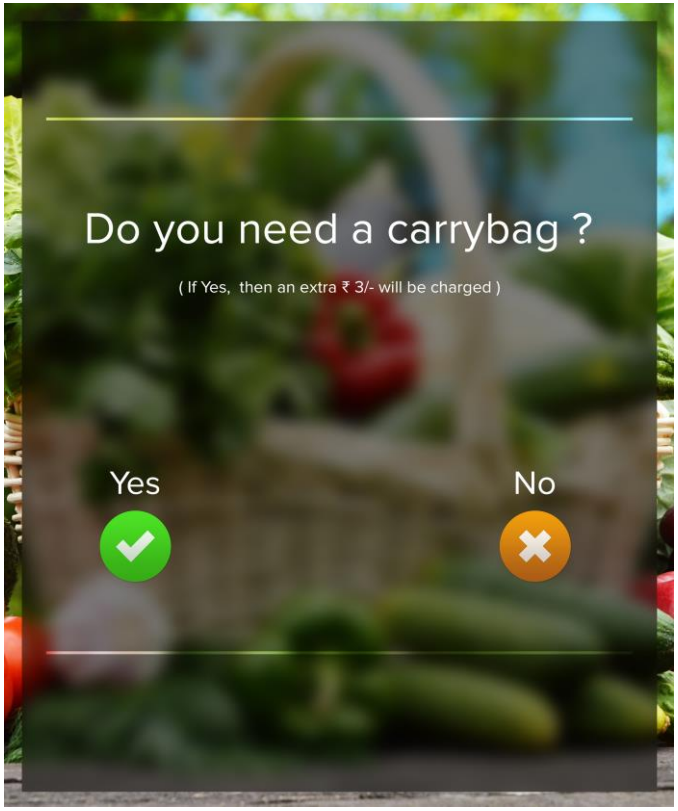


Fig.80: Interface- Customer

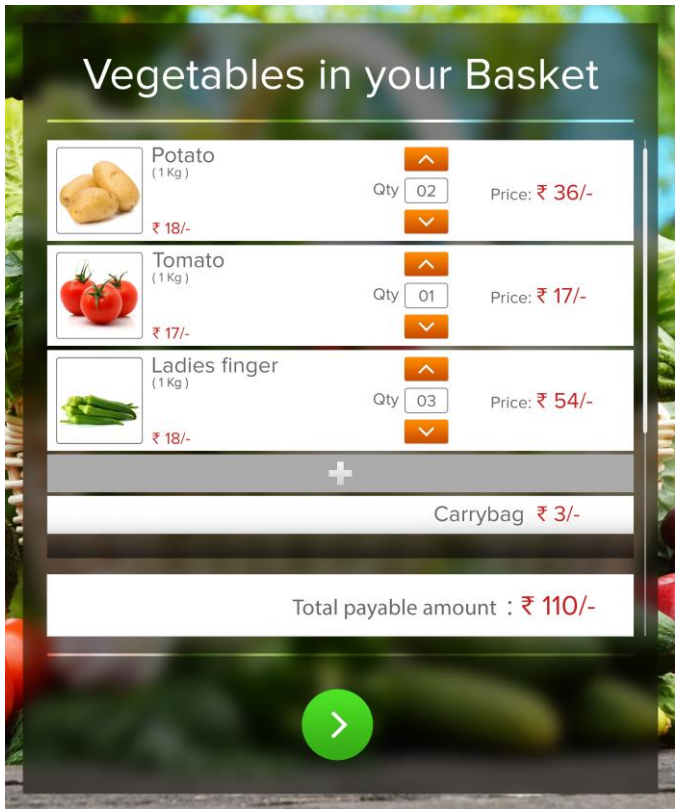


Fig.81: Interface- Customer

Customer

Then the system will ask the customer whether he/ she needs a carry bag or not. Refer Fig.80.
Accordingly ₹ 3/- will be added in the total price. Refer Fig.81.

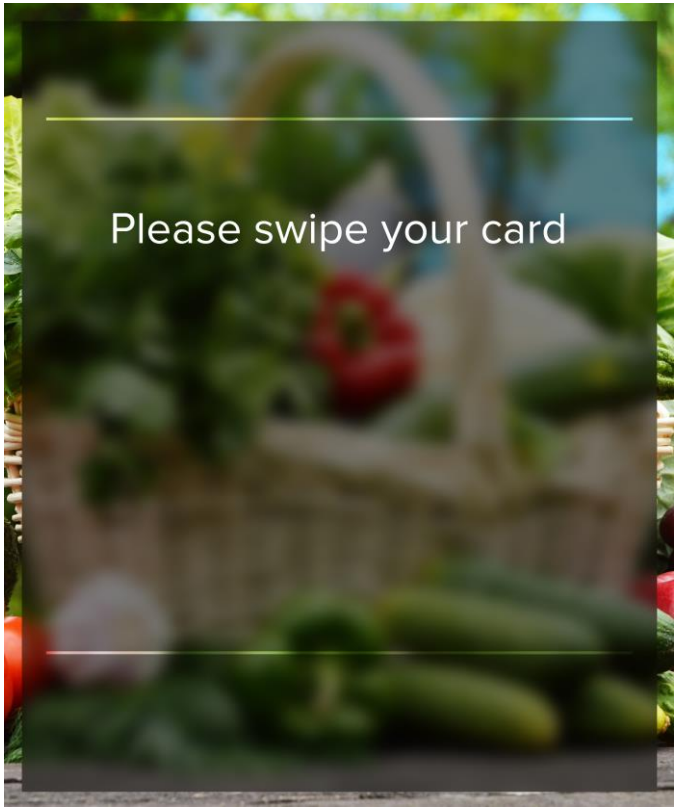


Fig.82: Interface- Customer

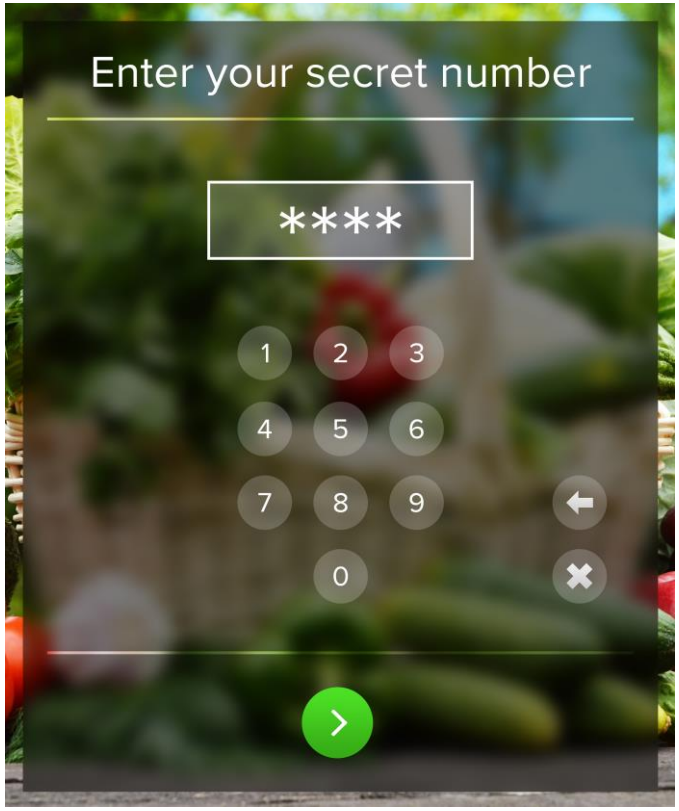


Fig.83: Interface- Customer

Customer

After finalizing the list of vegetables & carry bag option, the system will ask the customer to swipe his Debit/ Credit/ store value card. Refer Fig.82.
Then customer will type security code as shown in Fig.83.

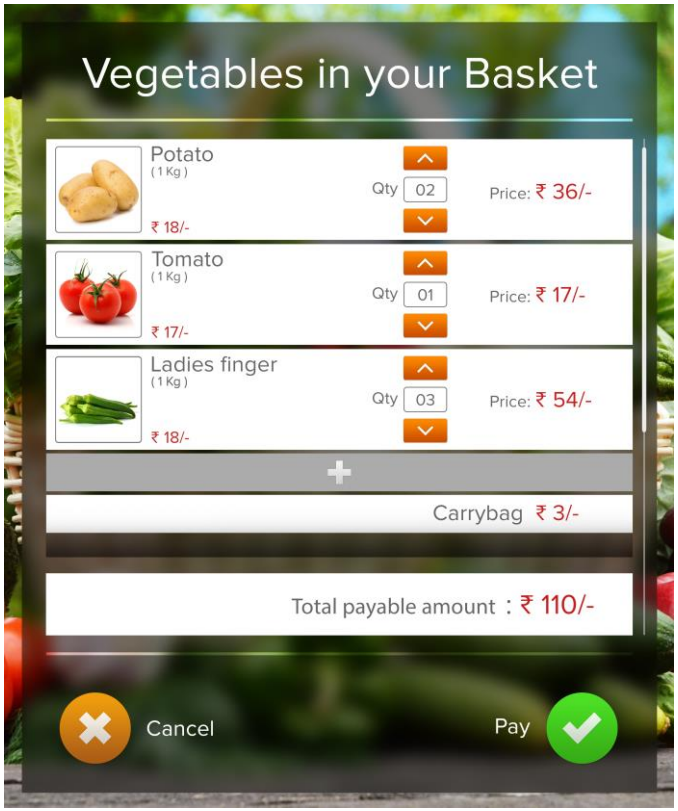


Fig.84: Interface- Customer

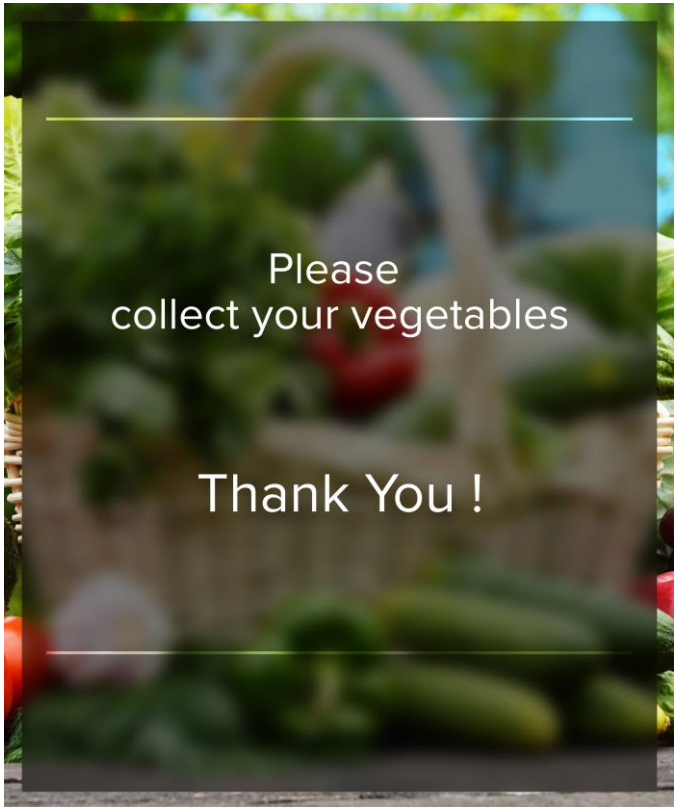


Fig.85: Interface- Customer

Customer

Once the security code is confirmed, the system will again ask customer to confirm his order. Refer Fig.84.
Once the order is confirmed, the payment will be done and the vegetables will be dispensed in the dispensing chamber. Then the “Thank You” note will be displayed on the screen as shown in Fig.85.

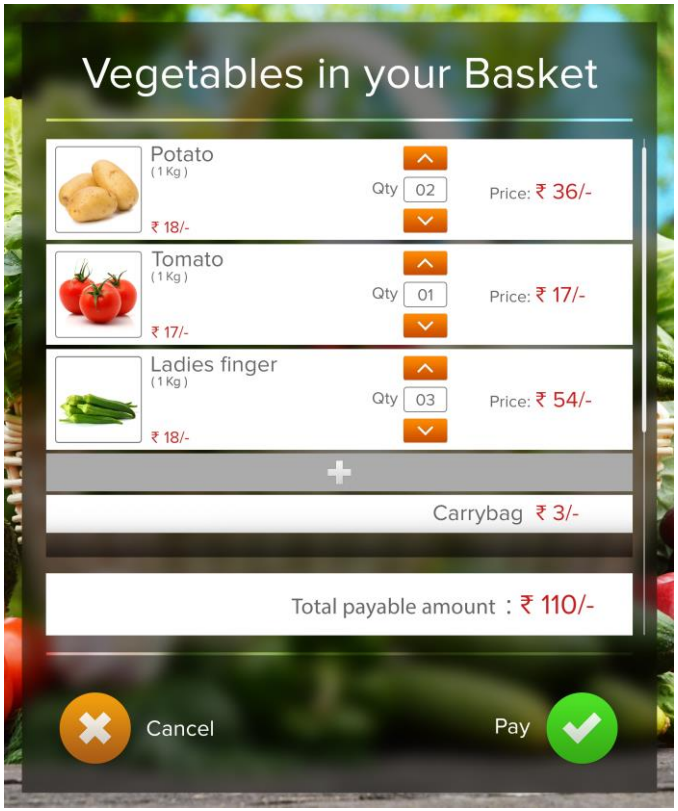


Fig.84: Interface- Customer

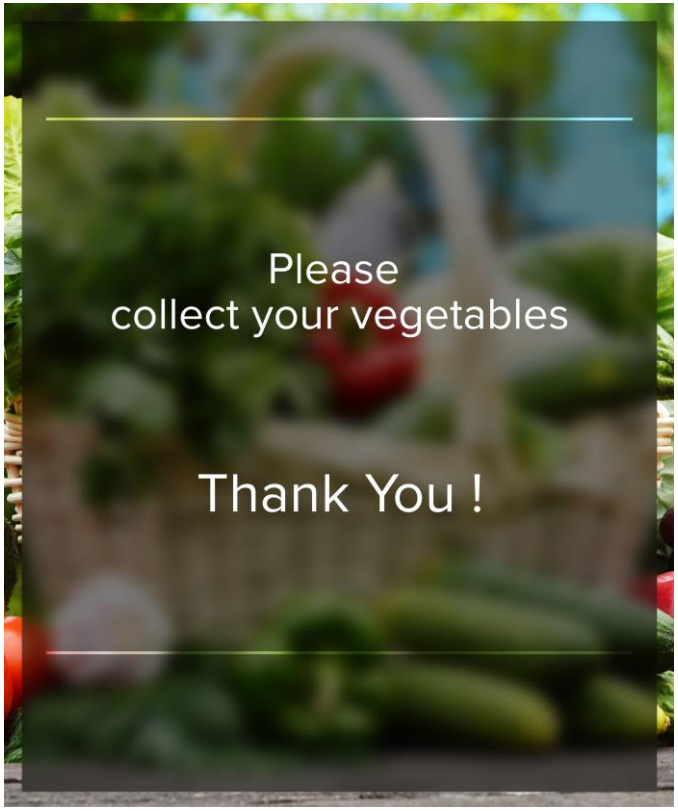


Fig.85: Interface- Customer

Customer

Once the security code is confirmed, the system will again ask customer to confirm his order. Refer Fig.84.
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Final form

Fig.86: Final form

Final form

Fig.87: Final form

References

[1] http://bestcurrentaffairs.com/india-is-second-largest-producer-of-fruits-vegetables-foodgrains/ as on 29th Jan, 2015

[2] http://en.wikipedia.org/wiki/Vending_machine as on 31st Jan, 2015

[3]http://agritrade.iift.ac.in/html/Training/ASEAN%20%E2%80%93%20India%20FTA%20%20Emerging%20Issues%20for%20Trade%20in%20Agriculture/Fruits%20and%20vegetables%20Supply%20Chain%20in%20India.pdf as on 31st jan, 2015

Bibliography

1. http://www.freshdelmonte.com/our-products/fresh-fruit-and-vegetable-vending-line/ as on 26th Jan, 2015
2. http://www.dailymail.co.uk/femail/food/article-2857593/Shoppers-buy-trays-potatoes-eggs-greens-vegetable-vending-machine.html as on 26th Jan, 2015
3. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&cad=rja&uact=8&ved=0CDEQFjAF&url=http%3A%2F%2Fwww.ruralfinance.org%2Ffileadmin%2Ftemplates%2Frflc%2Fdocuments%2F1176485646364_FAO_Punjabi___Fruits_and_Vegetables__FV__Supply_Chains.ppt&ei=QIjTVMrXCcKruQTH0YLYDQ&usg=AFQjCNG6JqjsOetbfvEvzoxuqZ8eDL46Ig&sig2=IRpvMaVcmTmOEB-D9tEExQ&bvm=bv.85142067,d.c2E as on 26th Jan, 2015
4. http://www.iimidr.ac.in/iimi/images/Publications/cases/Management_Case_Samridhdhhi.pdf as on 26th Jan, 2015
5. http://www.safefood.eu/safefood/files/89/8964f665-9bea-4c05-bacf-79e1eda9cd98.pdf as on 26th Jan, 2015
6. http://www.dailyrecord.co.uk/news/scottish-news/vegetable-vending-machine-unveiled-dundee-4730737 as on 1st March, 2015
7. http://www.perishablepundit.com/docs/freshday-vending.pdf as on 23rd March, 2015
8. http://www.godrejvending.com/Vending/product.aspx?id=7&menuid=807&catid=410&subcatid=0&subsubcatid=0&subsubsubcatid=0&productid=2680 as on 23rd March, 2015
9. http://www.cdph.ca.gov/programs/cpns/Documents/Network-FV-WP-VendingMachineStandards.pdf as on 23rd March, 2015
10. http://www.bbc.com/news/uk-scotland-tayside-central-30310449 as on 23rd March, 2015
11. http://www.soshiok.com/content/shanghai-gets-1st-veggie-vending-machine as on 23rd March, 2015

Image references

Product Category space

1. http://www.allstarsnacks.ca/AP_20Snack.jpg as on 23rd April, 2015
2. http://www.samsclub.com/sams/sel-23-selectivend-snack-23/prod9080020.ip?navAction=push as on 23rd April, 2015
3. http://miraclevendingservices.com/Machine%201.jpg as on 23rd April, 2015
4. http://www.avantivendingmachines.com/show_Product.asp?ID=11757 as on 23rd April, 2015
5. http://www.laurelfoodsystems.com/img/vending/vending-machines-bevmax-pepsi.jpg as on 23rd April, 2015
6. http://www.ausboxgroup.com.au/ims/drink_fridge1.jpg as on 23rd April, 2015
7. http://forumbiznesu.pl/admin/zdjecia/5056.jpg as on 23rd April, 2015
8. http://www.gmgvending.co.uk/image/images_machinesxl/SandenVendoG-SnackMaster.jpg as on 23rd April, 2015
9. http://www.normsconference.com/wp-content/uploads/2013/12/How-To-Save-Money-Using-Vending-Machine.jpg as on 23rd April, 2015
10. http://www.japanfs.org/ja/files/Peak-Shift_Vending_Machines.jpg as on 23rd April, 2015
11. http://www.intelligentvending.co.uk/refurbished-second-hand-vending-machines/rondo-6-40-second-hand-vending-machine.htm as on 23rd April, 2015
12. http://www.vend.je/files/cache/796654f9dbe855bf45e4e54daf18ed79.jpg as on 23rd April, 2015
13. http://www.kaffeepunkt.de/Kaffeepunkt/N%26W_Rock_files/Necta%20Rock.png as on 23rd April, 2015
14. http://www.revivevending.co.uk/blog/wp-content/uploads/2010/07/vending-machines.jpg as on 23rd April, 2015