
Industrial Design Project- 3

Redesigning shopping mall cart

Dipesh Parmar
07613009

Guide: Prof. Ramchandran

IDC
IIT Bombay

Approval Sheet

The Industrial design project 3 entitled “Redesigning shopping mall cart” by Dipesh Parmar (07613009) is approved, in partial fulfillment of the requirements for Master of Design Degree in Industrial Design.

Guide :

Chairperson :

Internal Examiner :

External Examiner :

Acknowledgements

I would like to express my sincere acknowledgements to my Guide Prof. Ramachandran for his constant guidance and motivation.

My sincere thanks to Prof. Bapat, Prof G G Ray, Prof Athavankar, Prof Shadhu & Prof Chakravarthy for their valuable inputs during stage presentations.

Also my sincere thanks to my friends and batch mates for their help and feedback.

Dipesh Parmar, April '09

Table of Contents

• Abstract	9
• Design Methodology	11
• Data Collection	12
Product study	12
User Studies	16
• Product Brief	23
• Layout of Gangway	24
• Analysis	25
• Ideation	26
With Frame structure	26
Without Frame structure	29
Stack ability	32
Space for Bigger items	33
Space for Liquid items	34
Seat for Child	35
Accessibility	36
• Concept	38
• Evaluation	52
• Simulation	54
• Refinement	55
• Final Product	65
• Reference	73

Abstract

Gradually mall culture has evolved and so the super markets in India. In metros like Mumbai utilizing space is a major factor. Malls use the space for their maximum benefit like displaying goods and storing more & more products. As a result the gangways become narrow making it difficult for people to move with their cart.

Focus of the project is to solve the existing problem. Shopping cart is one of the important factor in this system which contributes to the problem. There fore, shopping cart is taken up for redesigning to solve the above problem.

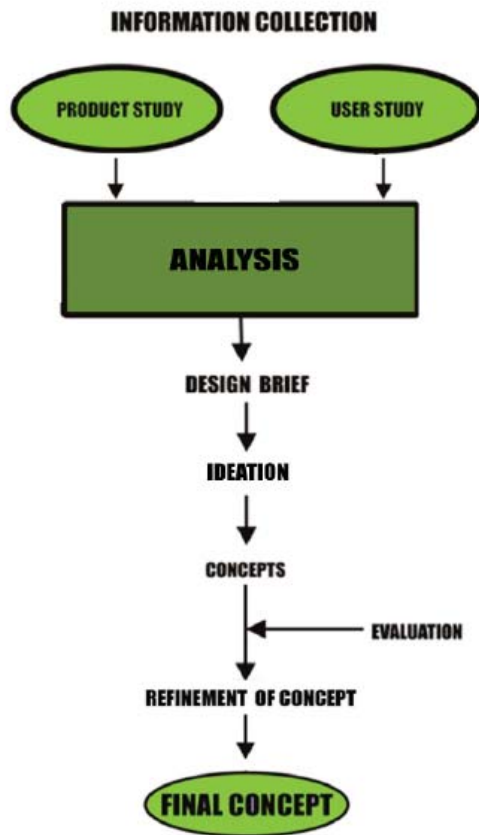


Fig 1

Design Methodology

Product study: Studied different types of trolleys available in the Indian and markets abroad.

User Studies: Aim of the user study was to find out various problems faced by people while handling and using the existing Shopping Trolleys

Analysis: After Product study and User studies, analysis was done to decide upon the basic need, aim and to set the focus of the project.

Design Brief: After the analysis design brief was prepared to mark the parameters for the project, before designing the solution for the Design problem.

Ideation: After finalizing the parameters for the designing, started with ideation, all sort of ideas were taken to consideration.

Concepts: From ideation, some of the ideas were finalized and they were taken and developed further and were changed into concepts from just being ideas.

Evaluation: All the final concepts were than evaluated, considering the evaluation factors and they were rated from 1- 10.

Refinement of concept: After evaluation an idea was finalized and was developed and refined further.

Final Rendering and Prototypes: Final idea was then rendered and mock up model was developed.

Data Collection

Project was started with data collection, studying the History of trolley, studying the various places where trolleys are used, different trolley types and different purposes of trolleys.

Various related projects done in IDC were also studied, aim was to know the kind of Design process and the methodologies that they followed.

Product study: Aim was to study different types of trolleys, the kinds of materials used, their sizes, their form and purpose. They have specific trolleys for each user group. The Different trolleys available are:

- **Special Trolleys for children**
- **Special Trolleys for handicap person**
- **New kind of baskets**
- **Trolleys with Locking system**
- **Trolleys using New technology**
- **Exploring New forms of trolley**

Special Trolleys for Kids: Trolleys specially for children have very bright colors to make them attractive and they mostly have cushioned seats to make them comfortable for child to sit as shown in fig:2 and also these trolleys have toys attached to them for the child to play. The trolleys specially for kids are in different forms, to make them more play full for kids as shown in fig:3 and they have special small trolleys for children to shop on their own and these trolleys have flags attached to them at a height, so that one can identify and see that trolley from a distance as shown in fig:4.



Fig 2 (Ref:1)



Fig 3 (Ref:2)



Fig 4 (Ref:3)



Fig 5 (Ref:4)

Data Collection

Special Trolleys for handicap person: There are special kind of trolleys for handicapped people, in which the Trolley can be attached to the wheel chair and the handicapped person can operate the trolley on his own as shown in fig:5.

New kind of baskets: There is a new range of trolley with telescopic handle for easy carrying as shown in fig:6, these baskets are also developed considering the stack ability as shown in fig:7, they are designed specially considering User purchasing less products and also they have different and multiple handles as shown in fig:6, fig:7, fig:8, There are also trolleys with just frames, where one need to fit baskets inside them as shown in fig:9, and there is range of three trolley basket as shown in fig:10, where one can carry these trolleys and collect the stuff inside and then can put them on the frames.



Fig 6 (Ref:5)



Fig 7 (Ref:5)

Fig 8



Fig 9 (Ref:6)



Fig 10 (Ref:6)

Data Collection

Trolley with Locking system: There is trolley with locking system as shown in fig:11 and fig:12 after using trolleys people drop them anywhere, so this trolley is designed specially to solve this problem. In order to shop with this trolley one need to insert one dollar coin into the locking system to unlock and to take the trolley along. After the shopping is done, in order to take that one dollar coin back, one need to keep the trolley back and lock them in the same manner.

Trolley using new technology: There are Trolleys with RFID and GPS system, which has a screen also as shown in fig:13, fig:14, that shows the layout of the shopping mall, has a bar code reader (RFID), identify the placing of the items and also helps in calculating the bill.



Fig 11 (Ref:7)



Fig 12 (Ref:7)



Fig 13 (Ref:8)



Fig 14 (Ref:8)



Fig 15 (Ref:9)



Fig 16



Fig 17 (Ref:9)



Fig 18 (Ref:10)

Data Collection

Exploring New forms of trolley: New forms, colors, materials etc have been explored with trolleys as shown in fig:15, fig:16. Extra attachments for babies have also been explored as shown in fig:17. Trolley designed by IDEO is shown in fig:18 that has solved the problem of compartments within a trolley, this trolley is a modular trolley, divided into different sections, but the lower three sections are very difficult to be used.

User Studies

Aim of the user study was to find out various problems faced by users of the metro cities, while using the shopping trolley in the mall and various issues related to it. After the user studies, there are four major problems faced by almost all the users, while using the trolley:

- Taking a Trolley
- Moving with trolley on the gang way
- Problem faced at the billing counter
- Leaving the trolley

Taking a trolley: The very first problem faced by the user is of collecting the trolley from outside the mall, as shown in fig:19.



Fig 19



Fig 20

Moving with the Trolley on the Gang way: Next problem faced by almost every user is of walking inside the shop with the trolley from one corner to another and also is too time consuming. Every user moving with the trolley has to stand and wait in the gang way, for the gang way to be cleared in order to move ahead. This problem increases to the maximum during the peak hours or during weekends.



Fig 21



Fig 22



Fig 23

User Studies

Bill counter: After the shopping is complete, next problem is faced at the billing counter at the queue as shown in fig:23. If there are many people in the queue with the same trolley, than it almost blocks the gangway , making it impossible for anyone to move and its too time consuming also. The long queue at the billing counter blocks the way of the other customers also inside the shop.



Fig 24

Leaving the Trolley: The last problem is of leaving the trolley. Generally all the users after using the trolley, or after transferring things from the trolleys into their vehicles as shown in fig:24, leaves the trolley there only, without caring, that it can be trouble for others, and for the person who need to collect and arrange the trolleys back everyday.

User Studies

Problem identified: After user studies many problems were identified faced in the Indian metro cities, but particularly related to trolley four major problems were identified.

No Extra compartments: The problem faced by all the users with the trolley is that, they doesn't have different compartments, to keep things separately. So because of this drawback, certain things gets spoiled for example- keeping the washing powder with some food item adds the smell of powder to the food item as shown in fig: 25.



Fig 25

No use of Lower space: Another problem was related to the usage of the lower space. Because of accessibility problem, very few users use the lower side to keep items at the lower area as shown in the fig:26.



Fig 26



Fig 27

User Studies

Size of the Trolley: Another problem is the size of the trolley which is too big, for the user to roam around in the gangway and create lots of problem as shown in the fig:27. User with this big trolley has to stand wait in the gangway to move ahead.



Fig 28

Height of the Child: Another problem is that slots of child seat are too small, size is 4x6'' as shown in the fig:28. Lots of problems are faced while putting the child inside the trolley and this can even hurt the child at times. The same problem is faced while taking the child out of the trolley also.

User Studies

After analyzing the user studies a buying pattern was developed as a result.

Week days (Less Crowd): Buying pattern shows that at week days 33% of the users prefer basket, and 67% of the users prefer trolley when the crowd is less. (Shown in fig:29)

Peak Hours: Buying pattern shows that 50% of the people prefer basket and 50% of the people prefer trolley at the peak hours. (Shown in fig:30) 17% people who were using trolley during less crowd, starts using basket during peak hours because of crowd.

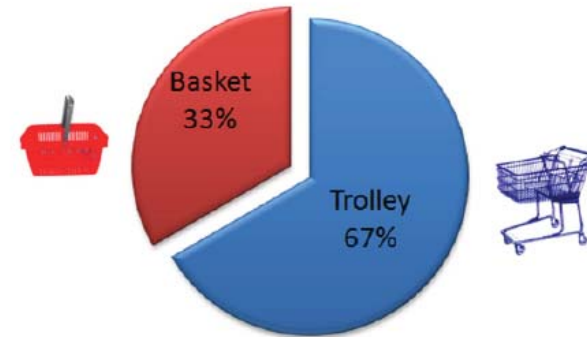


Fig 29

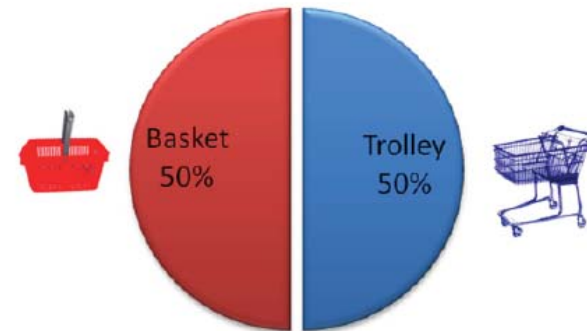


Fig 30

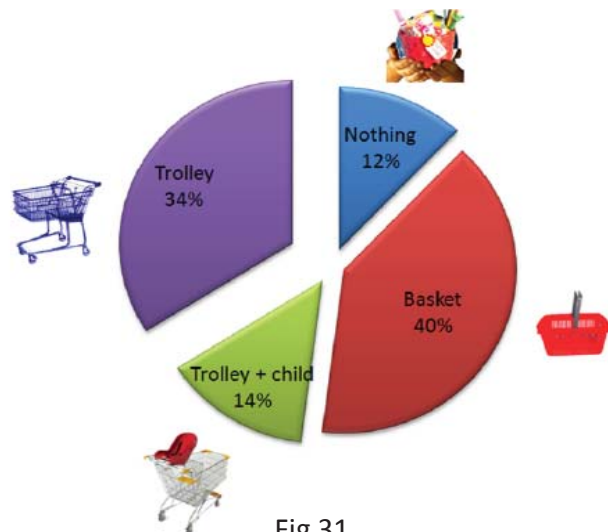


Fig 31

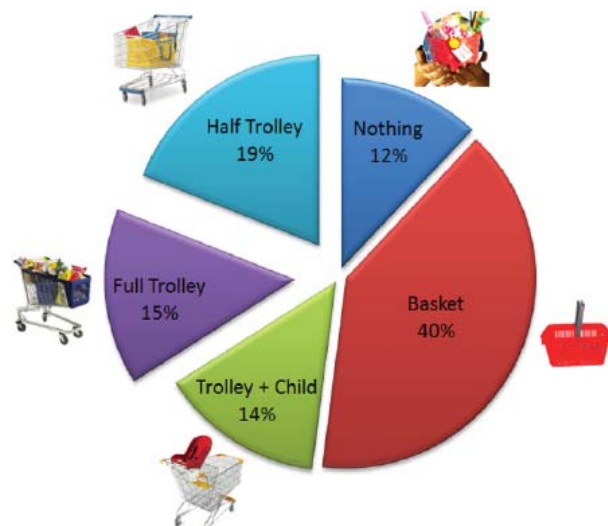


Fig 31.a

User Studies

Users in peak hours: During peak hours 50% of the users are using basket and 50% of the users are using trolley. This analysis can be further segregated as (shown fig:31)- Out of the 50% of basket users, 40% of the users actual uses a basket and 10% of the users carry things in hand. Out of 50% of the trolley users, only 14% of the users only carry child in the trolley.

Full Trolley users: 34% of the users, who are using trolley at the peak hours can be further segregated (shown fig:31.a). Out of 34% - only 15% of the users, are using full trolley and 19% users uses approximately half of the trolley. So these 19% of half trolley users, can be given a substitute of a little bigger basket, than the current one.

User Studies

Time taken at billing counter: Time taken at peak hours at the billing counter, it takes around 1:15 min. For 10 items, user with basket takes 2:15 min., time taken at the billing counter by the user with half trolley is 3:30 min., time taken by user with a full trolley is 4:55 min. At the billing counter.

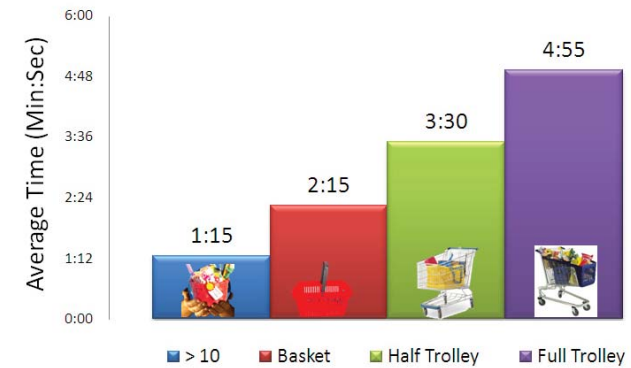


Fig 32

Product Brief

Gradually mall culture has evolved and so the super markets in India. In metros like Mumbai utilizing space is a major factor. Malls use the space for their maximum benefit like displaying goods, storing more & more products. As a result the gangways are made small making it difficult for people to move with their cart.

Focus of the project is to solve the existing problem. Therefore redesigning the existing shopping cart is of prime importance in problem faced.

Layout of Gangway

Current Scenario: In metro city all shopping mall average gang way size is 5 (feet 1525mm)

- Existing trolley size is 600 x 711 X 953 mm.
- Volume of the existing trolley is 78 liters
- Foot print (space consumed) is 600 x 711 mm.

Size of gangway left when two trolleys are placed side by side is 350mm (approximately 1feet) , but in the remaining 1 feet space its very difficult for any user to pass through. (Shown fig:33)



Fig 33

Proposed Trolley: These are the proposed dimensions, though there may be some fluctuation width or height of the trolley, though extreme dimensions are considered.

- Proposed trolley size is 460 x 680 x 953 mm.
- Volume of the proposed trolley (volume of single basket) is 57 liters
- Foot print (space consumed) 460 x 680 mm

With the proposed design if two trolleys are placed side by side, then the space left is 610mm (approximately 2feet), from which either one more proposed trolley can move or either another user can easily pass through. (Shown fig:33.a)



Fig 33.a

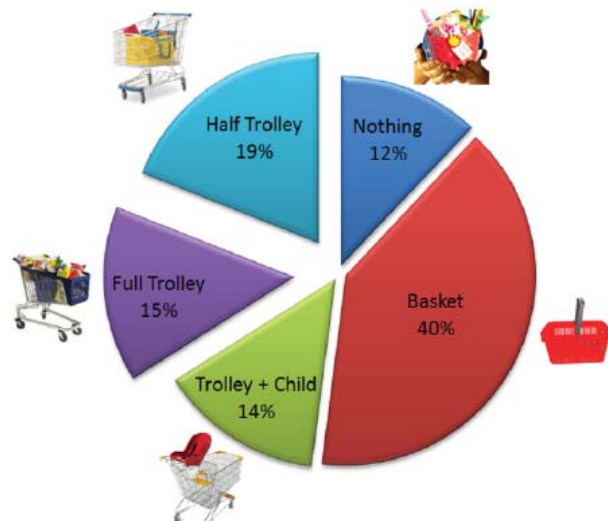


Fig 34

Analysis

Analysis from User Studies:

Dividing trolley in Baskets: Already 40% of the users are using basket at the peak hours and out of 50% of the trolley users 19% of the people are using approximately half trolley, so if those 19% of the people are given a little bigger basket than the total number of basket users will become 59%. So actually only 29% of people actually needs a trolley(14% carrying child in the trolley and 15% using full trolley) (shown fig:34)

Volume of the Trolley: Volume of the current trolley is 78 liters, so if existing two trolleys are placed side by side, then the space left in the gangway is approximately 1 feet, from which it is impossible for a trolley or a user to pass through.

But the volume of proposed design is approximately 57+57 liters (two different baskets), so the space left in the gangway is approximately 2 feet, from which it is possible for a proposed trolley or a user to easily pass through.

Ideation

After analysis, started with the ideation.

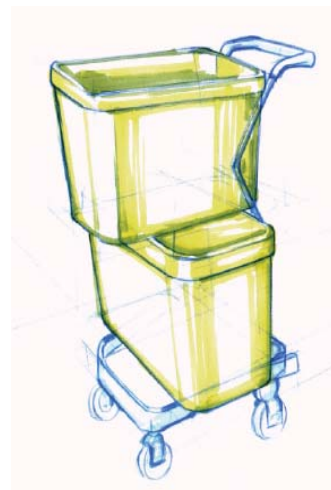
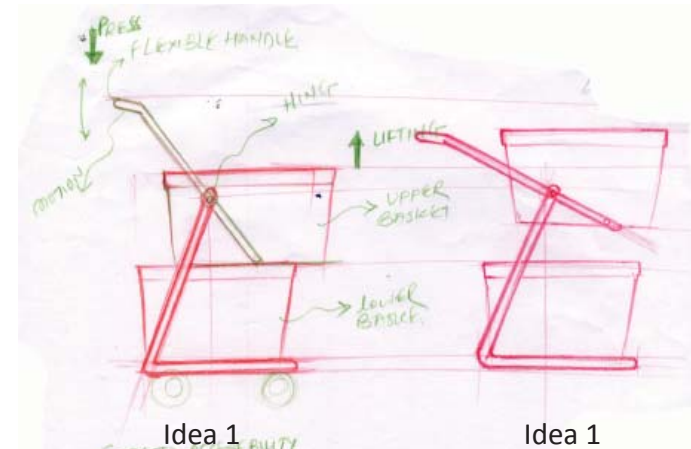
- **With Frame:** In this metal frame will be used to support the basket and the frame will take the whole weight
- **Without Frame:** This is Frame less trolley, in this case baskets will be nested upon each other and both the baskets will support each others weight.

With Frame structure:

Idea 1: As shown in fig:35, frame type structure is proposed with two basket combinations. Upper basket has a handle attached to it, whenever one wants to put any item in the lower basket, handle of the upper basket is pushed downward and the upper basket moves upward, this work likes a liver system as shown in fig:36.

Idea 2: Fig:37 shows frame type structure, where two baskets are used, and there is a lower basket, but 50% accessibility is blocked.

Idea 3: Fig:38 shows frame type structure, where one basket is bigger and the other is smaller, and there is extra space for keeping heavy item below.



Idea 2
Fig 37



Idea 3
Fig 38



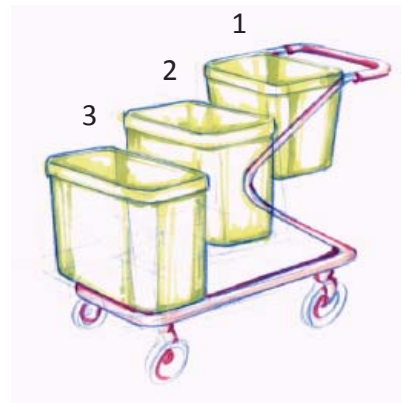
Idea 4
Fig 39



Idea 5
Fig 40



Idea 6
Fig 41



Idea 7
Fig 42

Ideation

With Frame structure:

Idea 4: Fig:39 shows frame type structure, here two baskets are used, with length and width combination, considering accessibility problems.

Idea 5: Fig:40 shows frame type structure where three baskets are used, where one is bigger and other two are equal, its a combination of modular baskets arranged according to customer needs.

Idea 6: Fig:41 shows frame type structure in a three modular basket combination, with a basket range that customer can arrange accordingly, but there is problem in accessibility of the lower front basket to move it to the front and to put it back.

Idea 7: Fig:42 shows frame type structure, with combination of three baskets, the baskets are modular and can be arranged according to the customer need, but there is a problem in the accessibility to move the last(3rd) basket front and back.

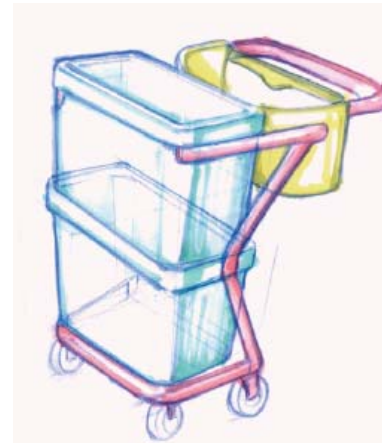
Ideation

With Frame structure:

Idea 8: Fig 43 shows frame type structure with two modular baskets with one baby seat, these baskets can be arranged according to the customers need, lower basket has the problem of accessibility, and the seat for the baby can be used according to the need.

Idea 9: Fig 45 shows frame type structure with two modular baskets, with extra seat for child, here the lower basket moves, left to right according to the need, to make it easy for the user to interact.

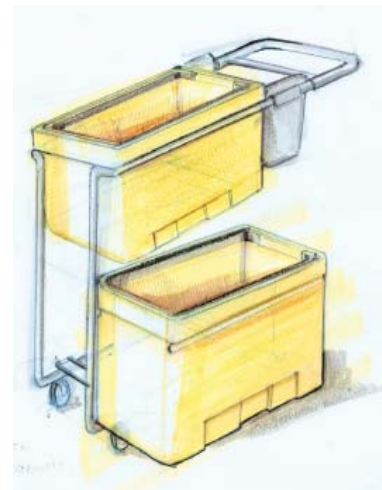
Idea 10: as show in Fig 46 Frame type structure. Basket can be arranged According to customers need. Its a two basket combination and the frame is divided in to two parts, one is right hand frame connected with the lower basket and second is left hand side frame connected with the upper basket. Ends of both the frames are pivoted together.



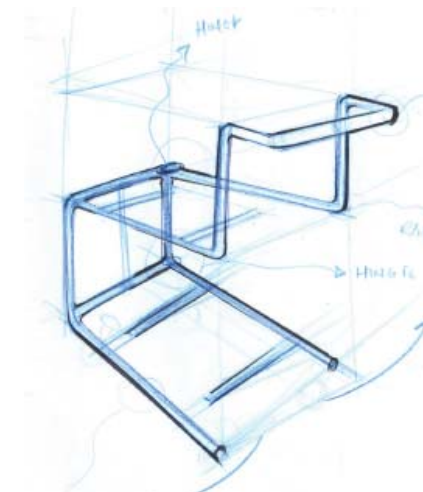
Idea 8
Fig 43



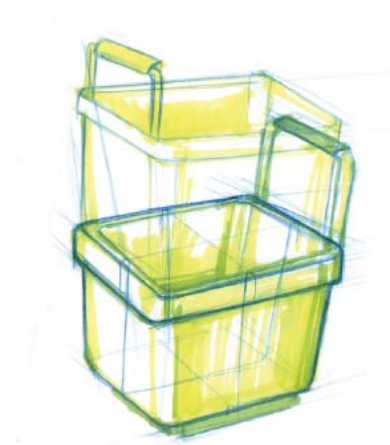
Idea 8
Fig 44



Idea 9
Fig 45



Idea 10
Fig 46



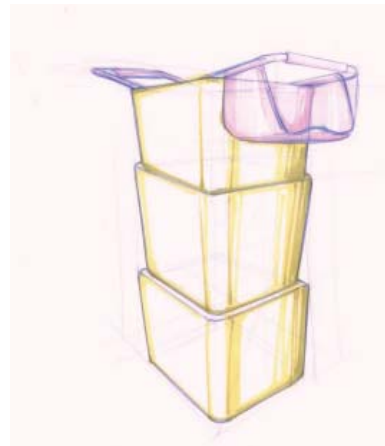
Idea 11
Fig 47



Idea 12
Fig 48



Idea 13
Fig 49



Idea 14
Fig 50

Ideation

Without Frame structure:

Idea 11: Fig 47 shows two modular baskets, when lower basket is full, one can use the upper basket, but there is problem in the accessibility of the lower basket.

Idea 12: Fig 48 shows frame less structure as the similar type of idea no 11.

Idea 13: Fig 49 shows two modular basket that can be arranged according to the customers and has a telescopic handle on both sides.

Idea 14: Fig 50 shows frame less structure with three modular baskets arranged according to customers need, but there is accessibility problem of the lower basket.

Ideation

Without Frame structure:

Idea 15: Fig 51 shows Frame less structure. In this two baskets are arranged in length and width combination. If the user has a child along, than there is special attachment for the child seat, but the problem with this design is that the child seat is very low and also it creates a problem in the accessibility of the lower basket.

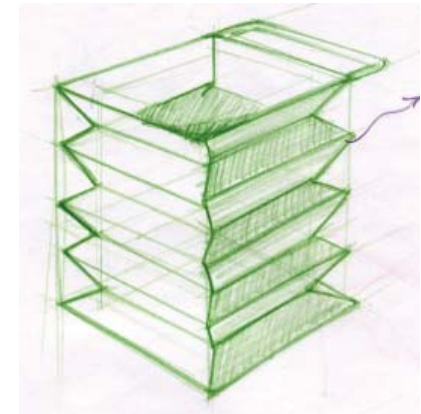
Idea 16: Fig 52 shows Frame less structure. New kind of basket opens according to requirement and the volume of the basket can be arranged according to the customers need.

Idea 17:Fig 53 shows Frame less structure. This design has two baskets pivoted at the left hand corner. When the user wants to use the lower basket, then he has to kick the lower basket in order to access and add items into it.

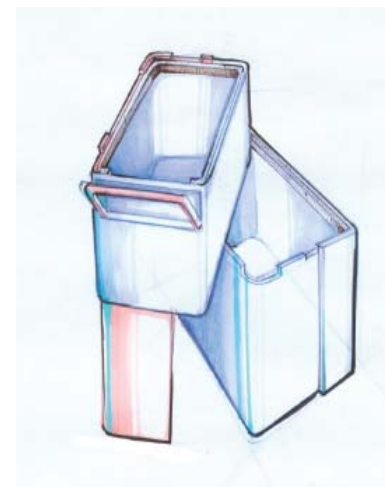
Idea 18: Fig 54 shows Frame less structure. This is a single basket. If user need more space in the basket the user can extend it, is a pulley type trolley and the volume of the basket can be increased according to the customers requirement.



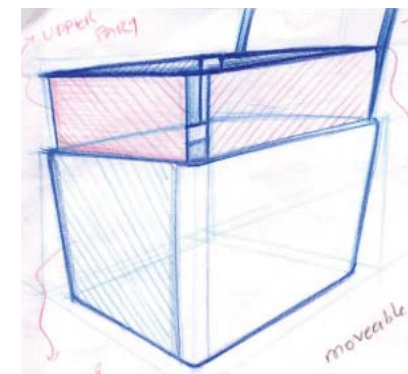
Idea 15
Fig 51



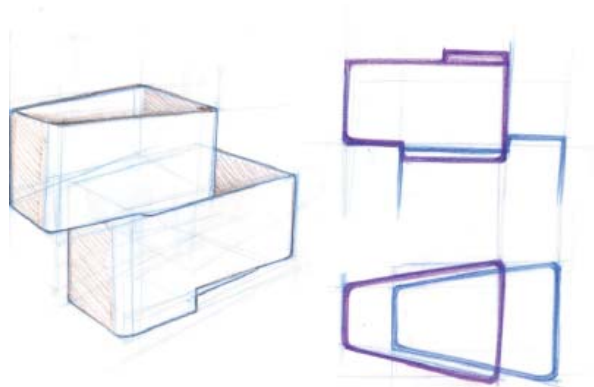
Idea 16
Fig 52



Idea 17
Fig 53



Idea 18
Fig 54



Idea 19
Fig 55

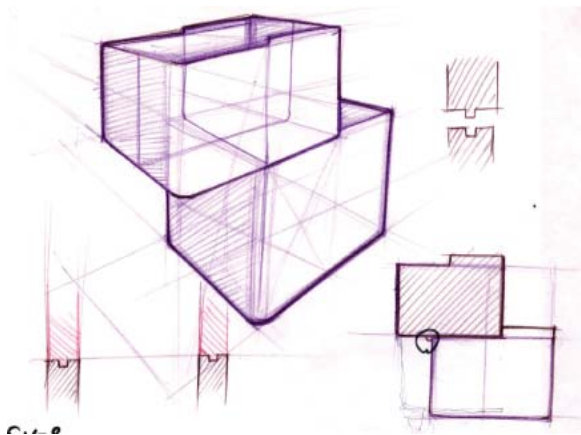
Fig 56

Ideation

Without Frame structure:

Idea 19: Fig 55 shows Frame less structure in this Two baskets are arranged according to customers need. These baskets are modular and are interlocked. And the position of the baskets can also be interchanged, and one can move the upper basket to the front in order to access the lower basket, but the problem is that the accessibility of the lower basket is 60% blocked.

Idea 20: Fig 57 shows Frame less structure. It is Similar to Idea no 19 basic difference that here for moving the upper basket guideline is provided.



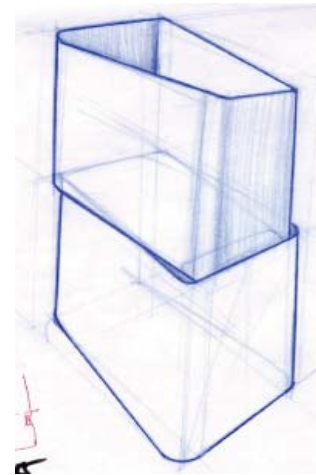
Idea 20
Fig 57

Ideation

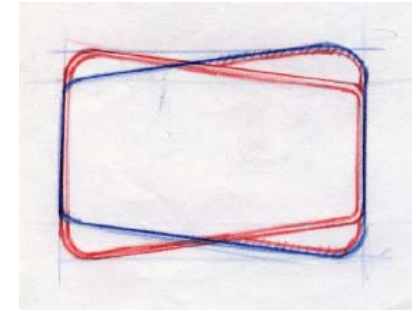
Stack ability: here stack ability means one basket fits over the other basket

Idea 21: Fig no 58 shows two modular trapezoidal basket one upon the other and these baskets rotate 180 degree fit and Fig 59 shows the top view of basket.

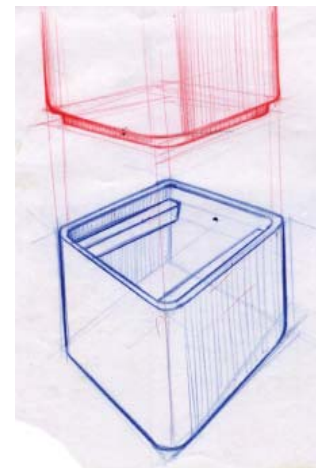
Idea 22: Fig 60 shows two modular basket with a small size cut in base, to fit the upper basket in lower basket.



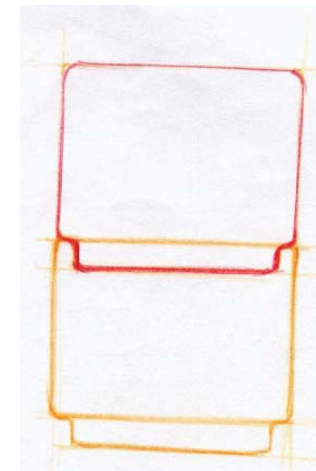
Idea 21
Fig 58



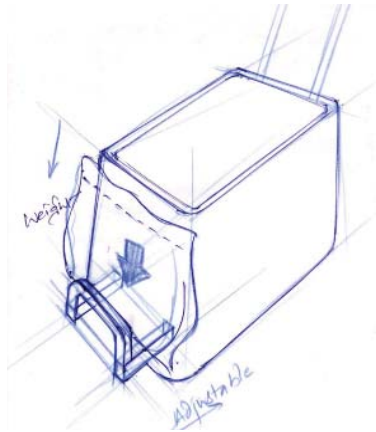
Idea 22
Fig 59



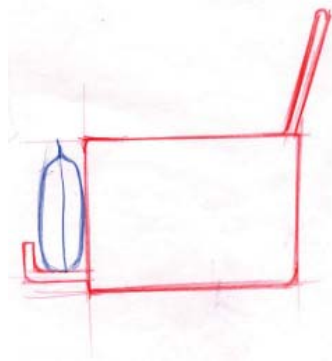
Idea 23
Fig 60



Idea 24
Fig 61



Idea 25
Fig 62



Idea 25
Fig 63

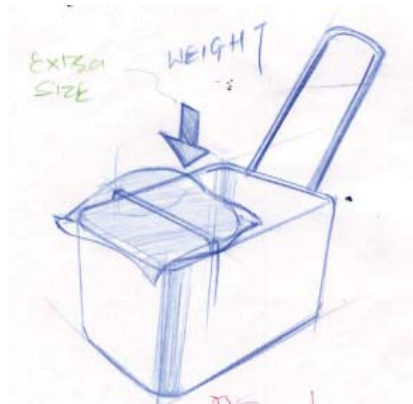
Ideation

Space for Bigger items: Bigger items mean wheat bag or rice packet of 5 Kg

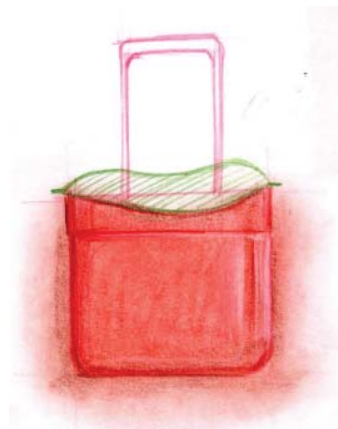
Idea 25: Fig 62 shows the front side of the basket, and there is an extension in the lower base to keep an extra bigger item at the base.

Idea 26: Fig 64 shows the basket that has an extra opening, that can be moved and can be slide to fit an extra heavy item into it.

Idea 27: Fig 66 shows the design in which the basket can be uplifted and a space is created at the base, where heavy items can be kept at the base, but this design has accessibility problem.



Idea 26
Fig 64



Idea 26
Fig 65



Idea 27
Fig 66

Ideation

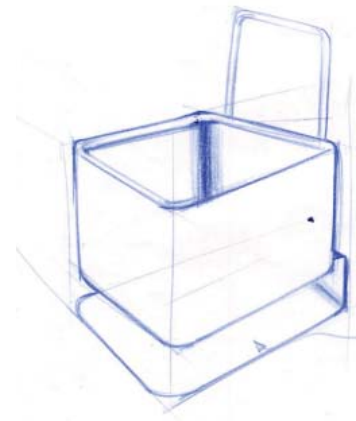
Space for Liquid items:

Idea 28: Fig 67 shows a basket, which has a tray at the lower side to keep liquid items separately like juice bottle etc.

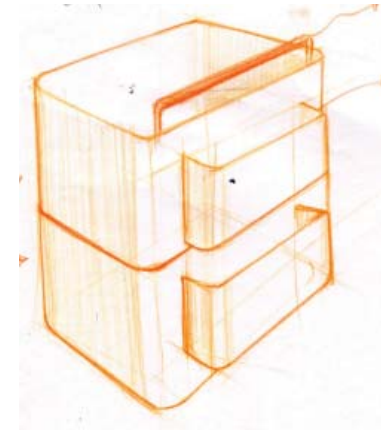
Idea 29: Fig 68 shows a basket that has extra compartments on the side to keep the liquid items.

Idea 30: Fig 69 shows a basket that has an extra compartment that is an extension on one side to keep all the liquid items, so when this compartment is not used, it can be kept closed.

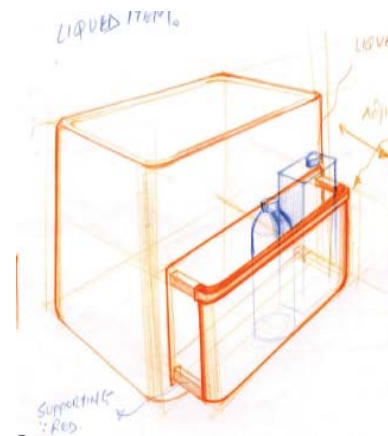
Idea 31: Fig 70 shows a combination of baskets , that creates a slot in between, where liquid can be stored.



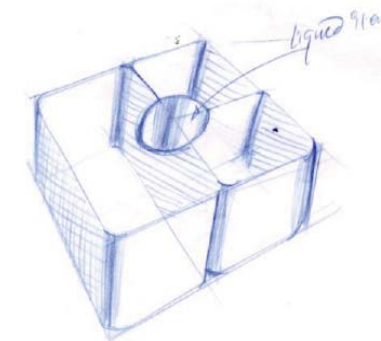
Idea 28
Fig 67



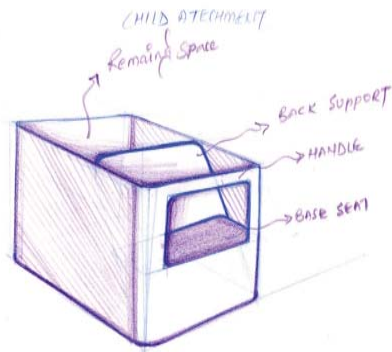
Idea 29
Fig 68



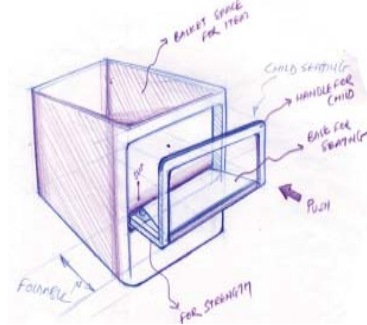
Idea 30
Fig 69



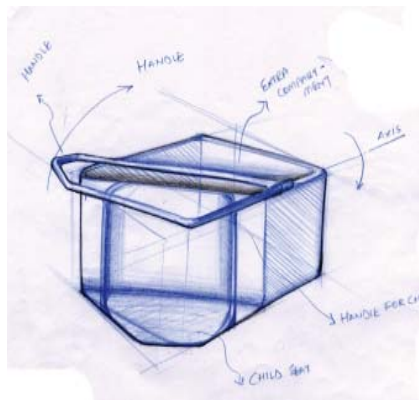
Idea 31
Fig 70



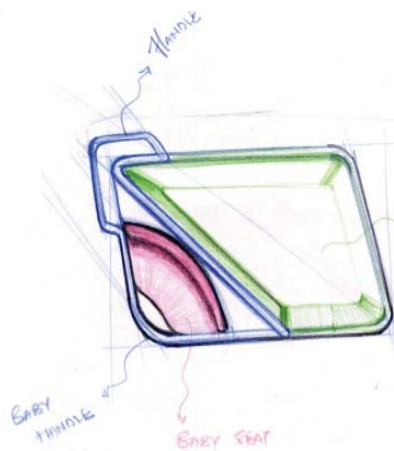
Idea 32
Fig 71



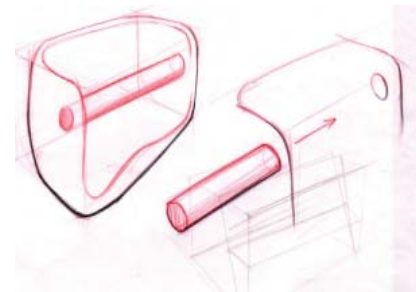
Idea 33
Fig 72



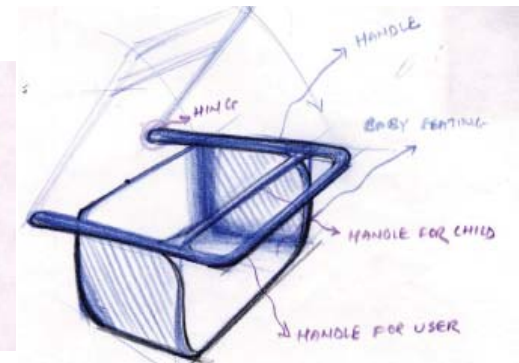
Idea 34
Fig 73



Idea 34
Fig 74



Idea 35
Fig 75



Idea 36
Fig 76

Ideation

Seat for Child:

Idea 32: Fig 71 shows a basket that has sitting arrangement inside the trolley, as it already exists also.

Idea 33: Fig 72 shows basket with a special foldable seat that is placed outside the basket.

Idea 34: Fig 73 shows basket with seating arrangement of the child, inside it, the 1/3 of the basket is the seat for child and 3/4 of the basket is can be used for carrying things.(fig:74 shows the top view)

Idea 35: Fig 75 shows an extra and external attachment for trolley

Idea 36: Fig 76 shows an extra and external attachment for trolley. In this the handle of the trolley is attached to the seat of the child.

Ideation

Accessibility: accessibility means easy to access and under reach.

Idea 37: Fig 77 shows locker kind of trolley with an upper and lower. It has open and close system.

Idea 38: Fig 78 shows two basket combination and upper basket has the tiers to move.

Idea 39: Fig 79 shows frame type trolley, this is a trolley which has a system for accessibility, the trolley has a foot operated lifting mechanism, through which the trolley goes up and becomes easy to access for the user

Idea 40: Fig 80 shows without frame trolley, which has a combination of two baskets. The lower basket has a opening, which can be opened and closed according to the requirement.

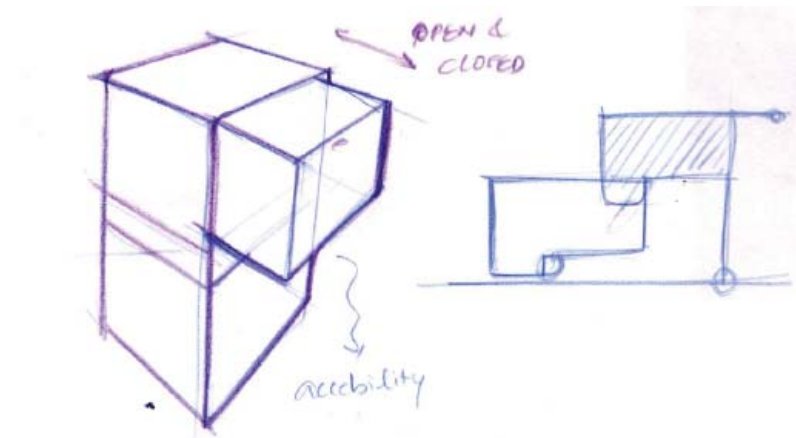
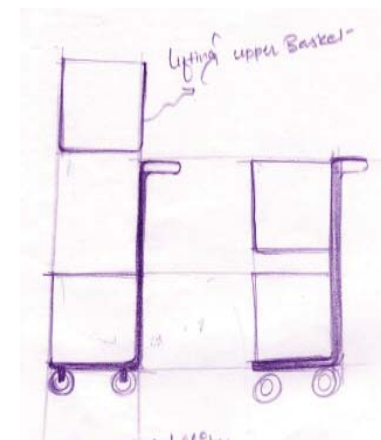
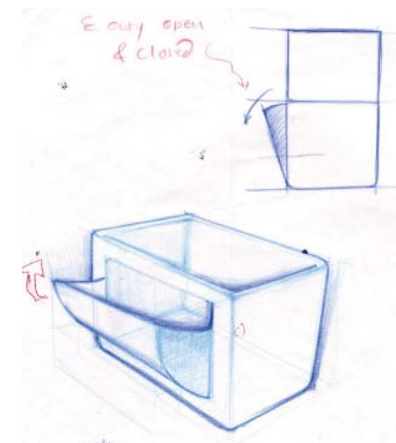


Fig 77
Idea 37

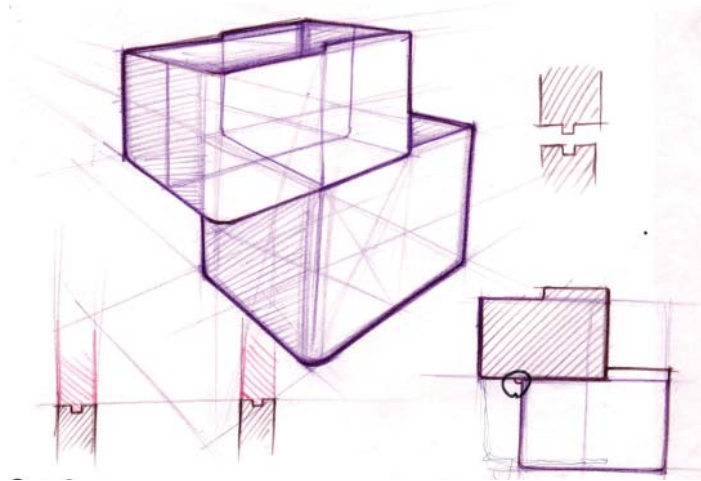
Idea 38
Fig 78



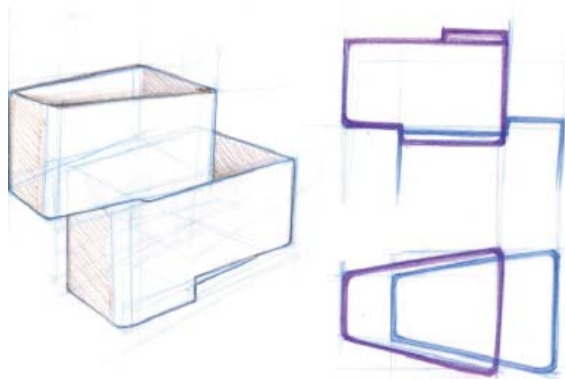
Idea 39
Fig 79



Idea 40
Fig 80



Idea 41
Fig 81



Idea 42
Fig 82

Ideation

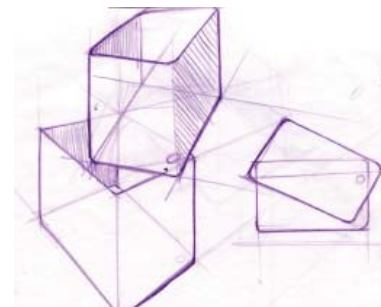
Accessibility:

Idea 41: Fig 81 shows without frame trolley. It has Combination of two baskets with a groove system for locking and supporting the upper basket.

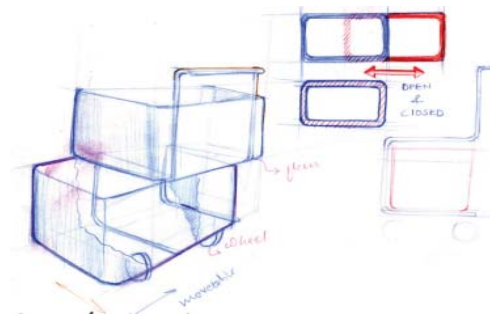
Idea 42: Fig 82 shows without frame trolley. It has a Combination of two baskets and the profile of the basket creates self locking system.

Idea 43: Fig 83 shows without frame trolley. It has a Combination of two baskets and these baskets are pivoted in the corner for lower basket accessibility.

Idea 44: Fig 84 shows frame trolley. Rail system is there for easy move, to make the accessibility of the lower basket easier.



Idea 43
Fig 83



Idea 44
Fig 84

Concept

Concept 1: This basket helps the user shop more, this concept provides user with more space. The basket is shown in fig:89, and if the basket is lifted from one end, it extends and opens up a new basket creating more space, for more storage, as shown in fig:85. Are stack able as shown in fig:87 and This extension can be of metal also, in the form of metal rods as shown in fig:86. When metal rods comes out after pulling them from the base, half of them remains straight and half of them falls in the angel of 90 degree, thus creating a space for keeping things, by creating a partition or a compartment.

There is special attachment for child, which is really low and extra attachment that can be added if required. Side view of final basket is shown in fig:90

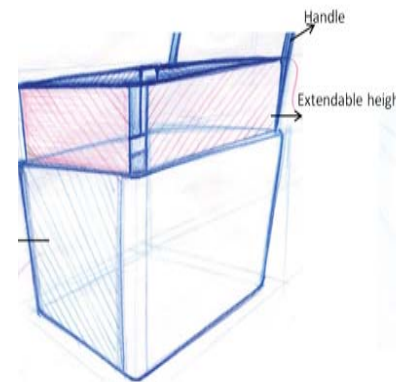


Fig 85

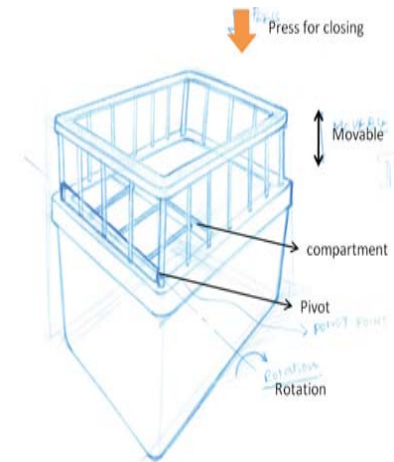


Fig 86

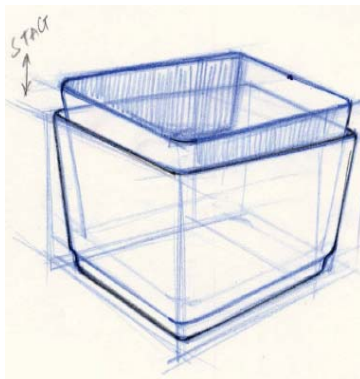


Fig 87

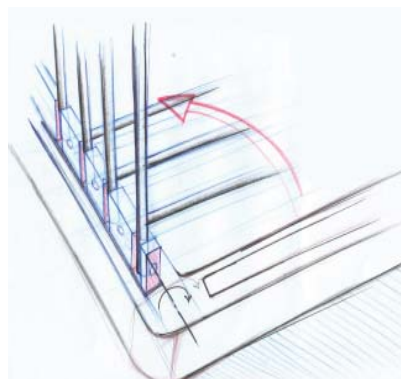


Fig 88

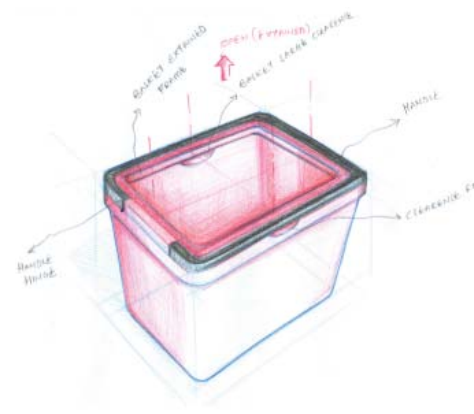


Fig 89

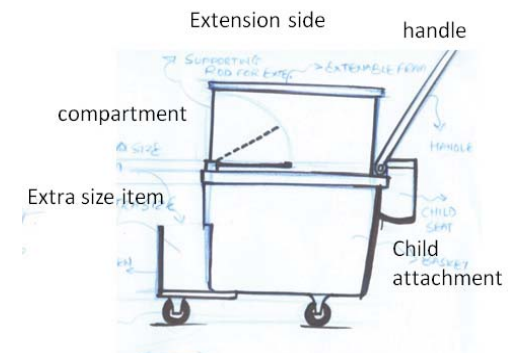


Fig 90

Concept

Concept1:

Rendering of Concept 1 is shown in Fig 91.

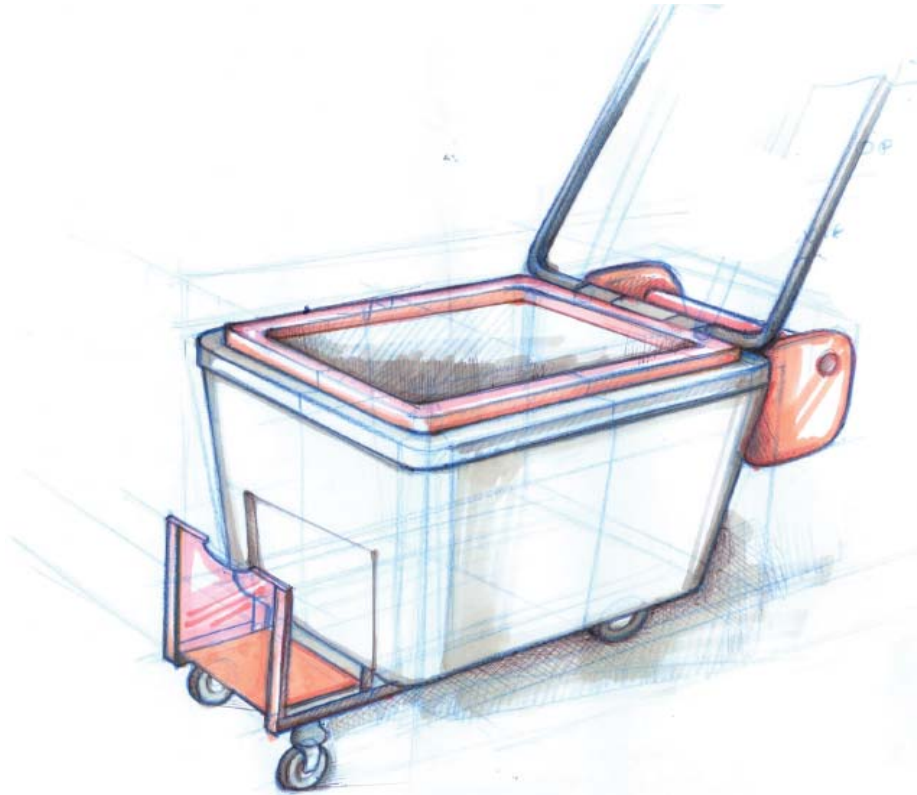


Fig 91

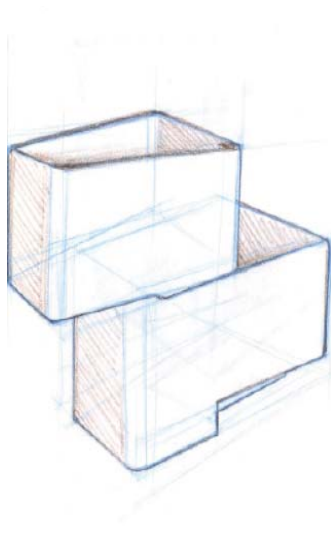


Fig 92

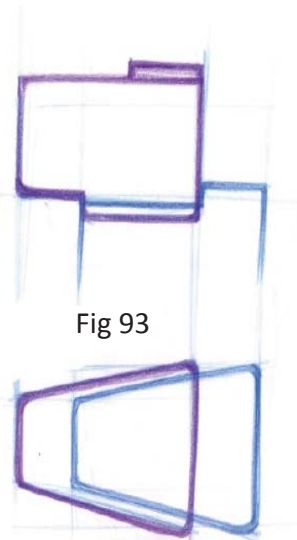


Fig 94

Concept

Concept2: Fig:92 shows Frame less structure, in this Two baskets are arranged according to customers need. These baskets are modular and are interlocked. And the position of the baskets can also be interchanged, and one can move the upper basket to the front in order to access the lower basket, but the problem is that the accessibility of the lower basket is 60% blocked. Fig:94 shows the top view of the concept and fig:95 shows the stack ability of the concept. This single basket can also be used as pull type basket as shown in fig:96. Locking between the baskets is explained in Fig 97. Child seat is also extra attachment, and can be attached per requirement and shown in fig:98, two final baskets are shown in fig:99



Fig 95



Fig 96



Fig 97

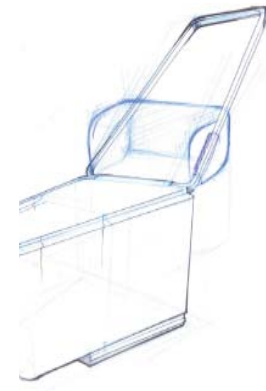


Fig 98

Concept

Concept2: Fig:92 shows Frame less structure, in this Two baskets are arranged according to customers need. These baskets are modular and are interlocked. And the position of the baskets can also be interchanged, and one can move the upper basket to the front in order to access the lower basket, but the problem is that the accessibility of the lower basket is 60% blocked. Fig:94 shows the top view of the concept and fig:95 shows the stack ability of the concept. This single basket can also be used as pull type basket as shown in fig:96. Locking between the baskets is explained in Fig 97. Child seat is also extra attachment, and can be attached per requirement and shown in fig:98, two final baskets are shown in fig:99

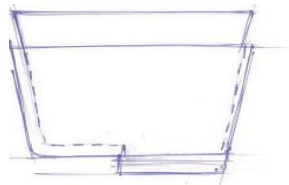


Fig 95

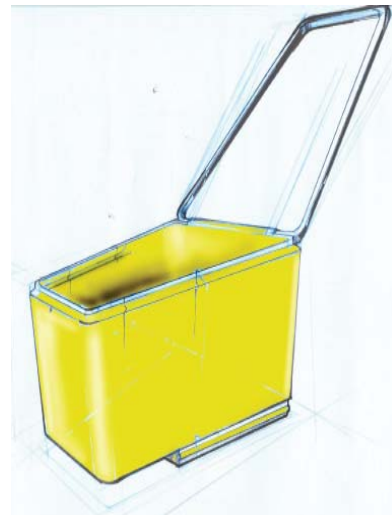


Fig 96

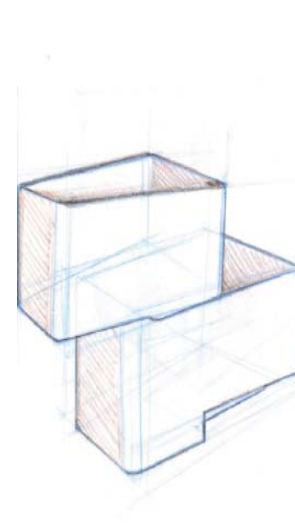


Fig 92

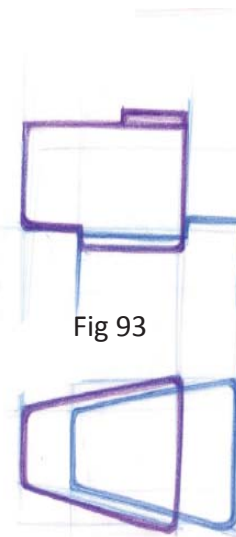


Fig 94

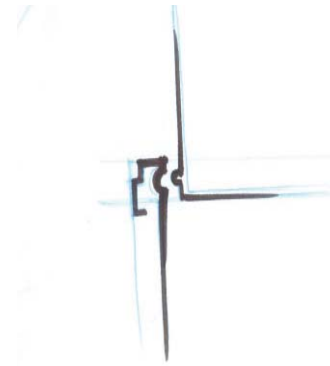


Fig 97

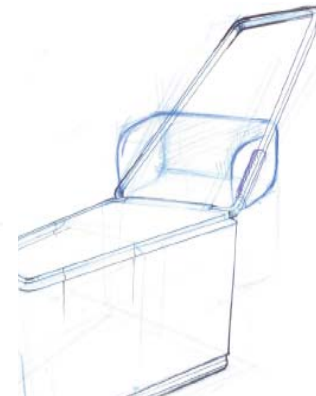


Fig 98

Concept

Concept2:

Sketch of Concept 2 is shown in Fig 99.

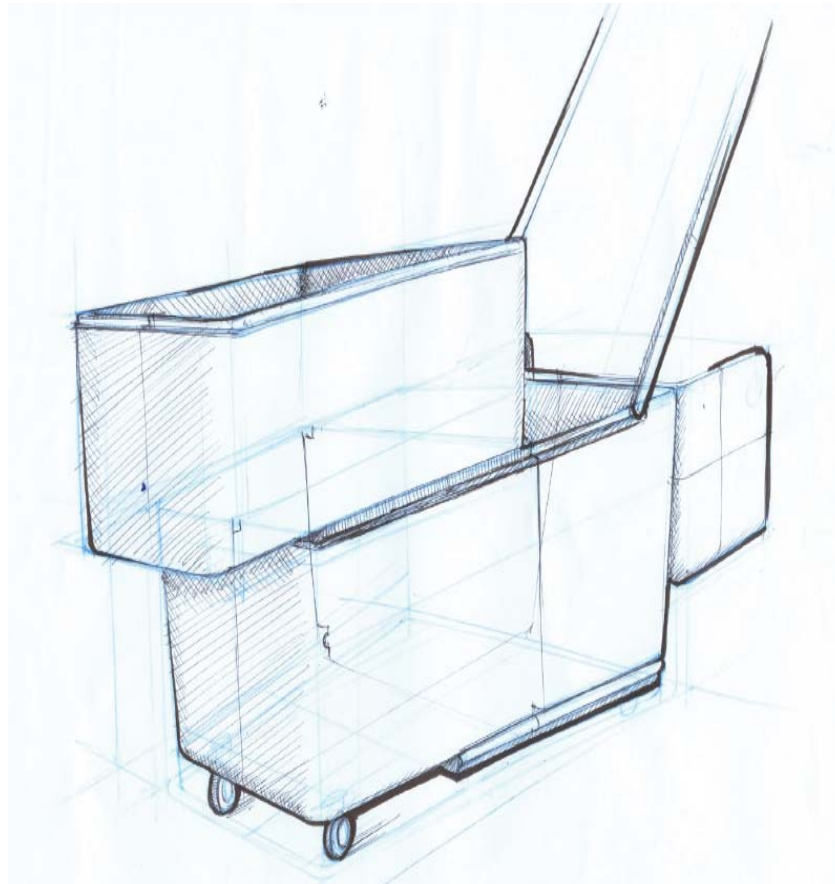


Fig 99



Fig 100



Fig 101

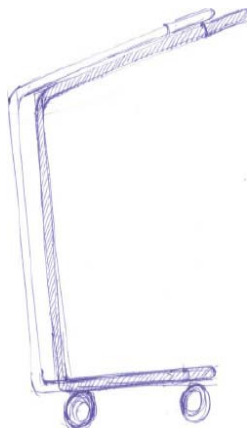


Fig 102

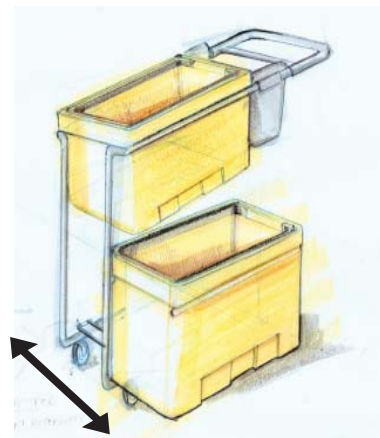


Fig 103

Concept

Concept3: Fig:100, shows another basket with frame. In this case, these baskets are modular, and are stack able as shown in fig:101, and the frames are also stack able as shown in fig:102. This single basket can also be used as pull type baskets. There is separate attachment for child and can be placed, if required. Considering the accessibility of the lower basket, it can be moved in the right and left direction, by pushing it with feet as shown in fig:103. Lower basket has the rail system, for the basket to move easily and considering the accessibility by the user. The trolley has a telescopic handle that can be used to lock the child while the child is seated on the attachment as shown in fig:105. The rendered image of the concept is shown in fig:104

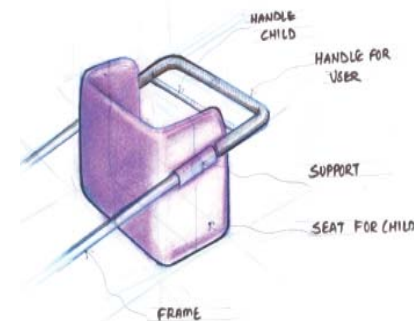


Fig 104

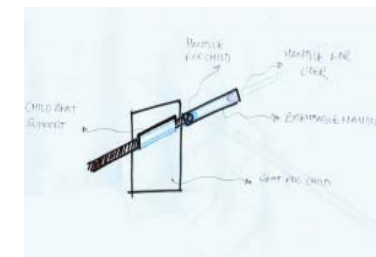
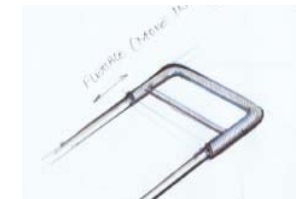


Fig 105

Concept

Concept3:

Rendering of Concept 3 is show in Fig 106.

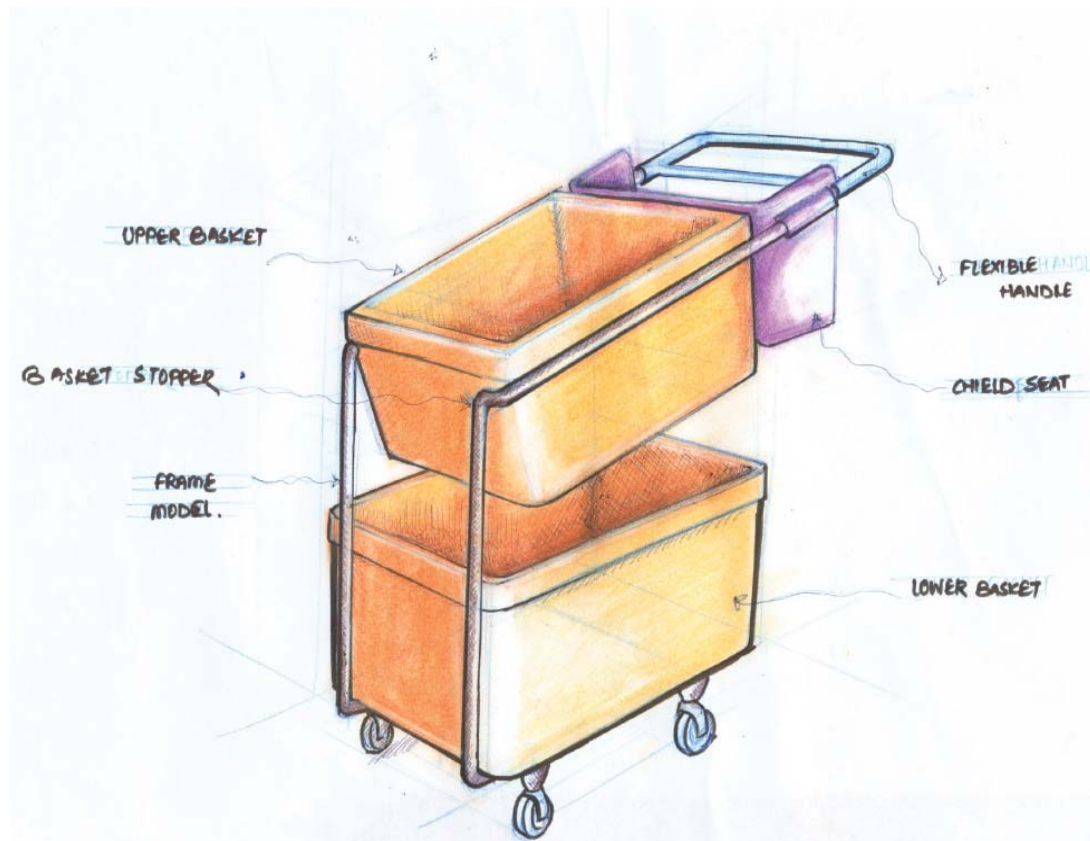


Fig 106

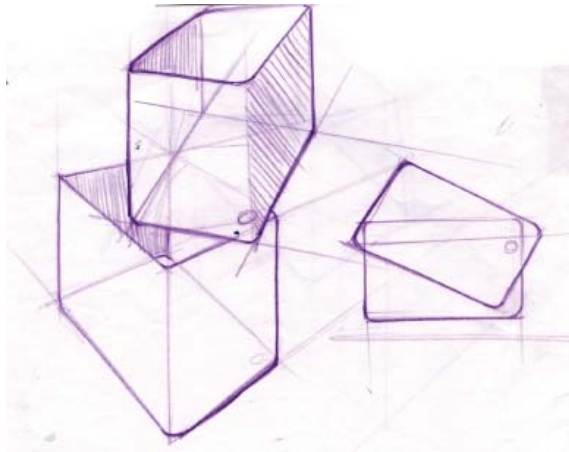


Fig 107

Concept

concept4: The fig:107 shows frame less trolley, where two baskets are connected with a pivot at the corner, to make the accessibility of the lower easier. The position of the handle has been finalized on the opposite side of the pivot because 90% of the Indians are right handed, shown in fig:108. This single basket can also be used as pull type basket shown in fig:109

User can use two of these baskets at a time, according to the need, and these baskets are stack able also and for that this basket is divided into three parts as shown in fig:110. The pivot joint can be joined to the upper basket for support as shown in fig:112.

The rendered image of the concept is shown in fig:113

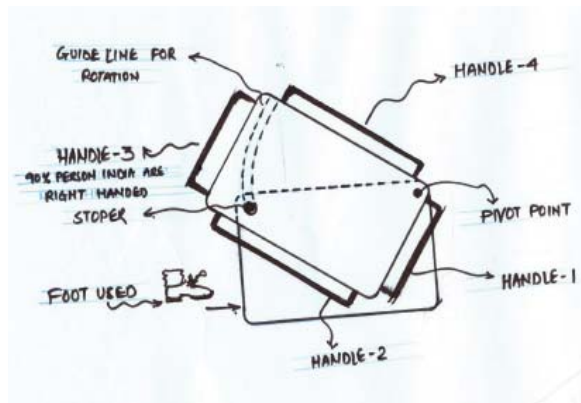


Fig 108



Fig 109

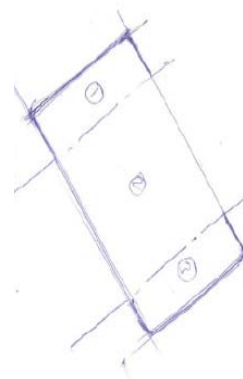


Fig 110

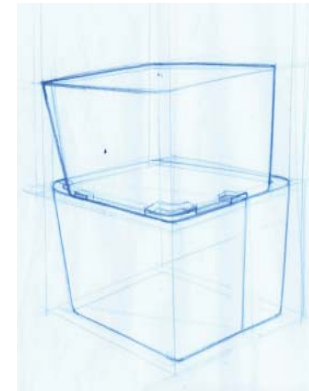


Fig 111

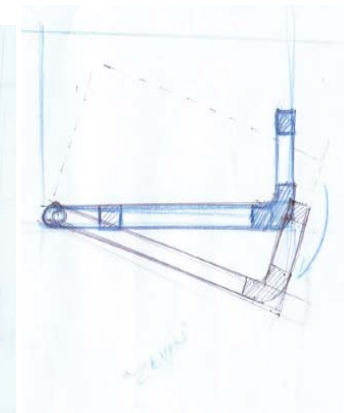


Fig 112

Concept

Concept4 : as show in Fig 113 is rendered image of the concept 4. Upper basket is attached with lower basket and there is extra wall attached to the lower basket for support.

Concept5: Fig 114 shows Frame type structure, In this concept Basket can be arranged according to customers need. Its a two basket combination and the frame is divided in to two parts, one is right hand frame connected with the lower basket and second is left hand side frame connected with the upper basket. Ends of both the frames are pivoted together.

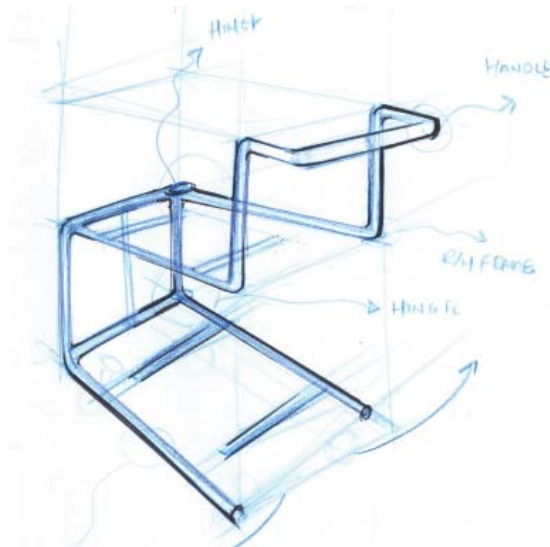


Fig 114

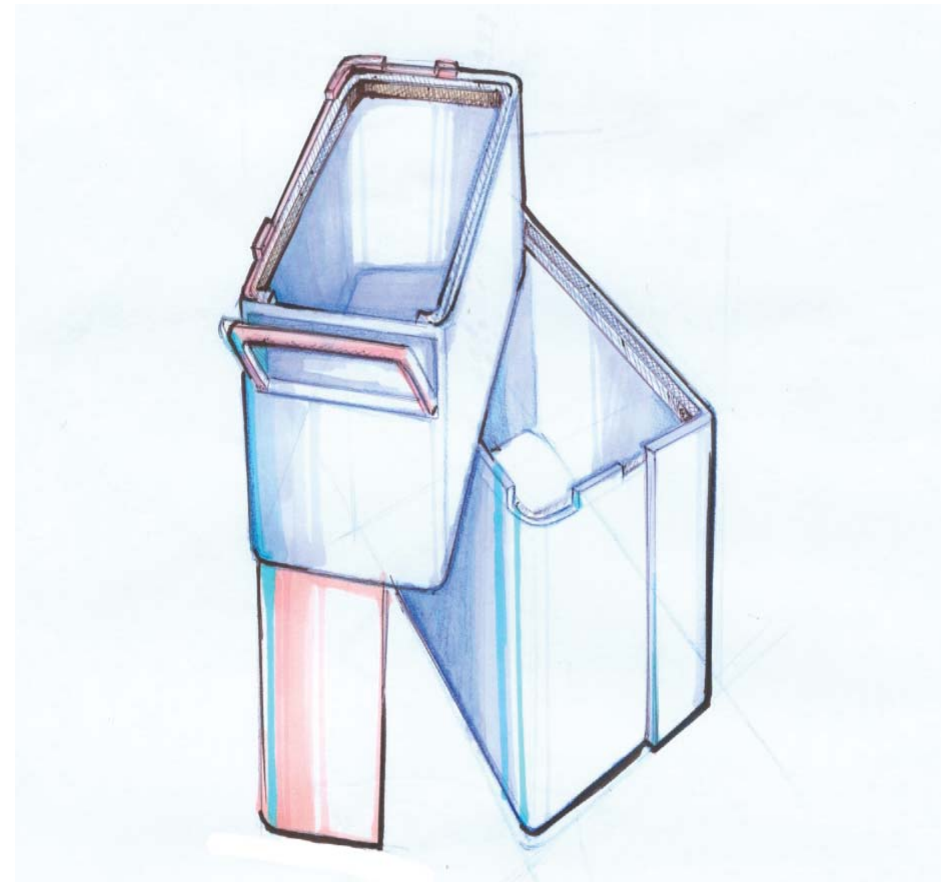


Fig 113



Fig 115

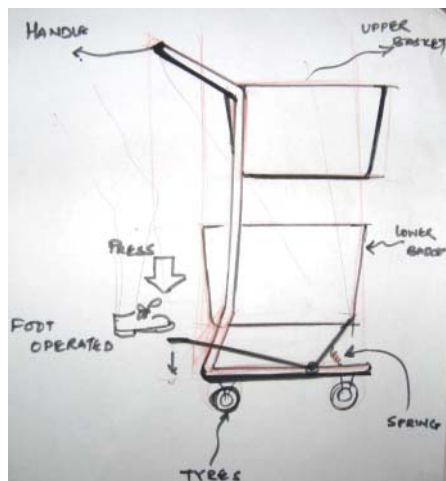


Fig 116

Concept

Concept6 : Fig:115, shows trolley with frame, trolley has a lever system, when a person wants to access the lower basket, than presses the lever with his feet, and then the lower basket comes out and one can access that basket and can keep stuff inside that lower basket and as soon as user leaves that lever, the lower basket goes back inside as shown in fig.116. This single basket can also be used as pull type baskets.

Evaluation

All concepts are evaluated on the base of weightage

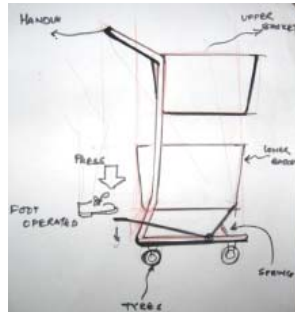
- Computability (60% weightage)
 - 1-Accessibility
 - 2- Footprint
 - 3- Handling at the billing counter
- Stack ability (60% weightage)
 - 1-Goods
 - 2- trolley
- Loading and unloading (30% weightage)
- Child seat (10% weightage)

All dimension in inches

				basket				trolley		
			height	length	width		height	length	width	
current trolley size							37.5	30	24	
concept-1			15	24	15		22	24	15	
concept-2			15	20	15		27	20	15	
concept-3			13	24	13		37	24	20	
concept-4			13	24	15		37	27	29	
concept-5			13	24	15		37	27	29	
concept-6			13	24	15		37	30	17	



Concept:3



Concept:6

Evaluation

All concepts were evaluated on the base of assigned weightage.

Results after the calculation:

Foot prints in concept 4 and concept 5 are even more then the existing trolley available in various shopping malls, so both these concept were removed from the final consideration.

The two final concepts considered for final evaluation are the concept 3 and concept 6.

	Accessibility	Foot Print	Handling at Bill Counter	Stack ability for Goods	Stack ability for trolley	Loading -Unloading	Child Seat	Total
concept-1	27	34.2	16.2	33	23.4	10.2	2.2	146.2
concept-2	28.8	31.8	16.2	34.2	29.4	12	3.6	156
concept-3	38.4	31.8	28.2	36	29.4	15.9	4.8	184.5
concept-4	27.6	9	11.4	23.4	23.4	9.9	1.5	106.2
concept-5	27.6	9	11.4	23.4	23.4	9.9	1.5	106.2
concept-6	37.8	30.6	30	35.4	28.8	15.6	0.2	178.4

Simulation

Concept 6 was rejected after analysis with the concept number 3, because every time pressing the lever with the feet to use the lower basket was creating more chances of accident, and also in order to use the lower basket, one need to press the lever continuously and as soon as the lever was left, the lower basket goes back. Another problem is of the stack ability of the frames of the trolley was not possible, because of the lever system.

After finalizing upon the concept 3, mock up model was made and simulation was done and feedback was taken from user for refinement and the basket size that was finalized was 13 x 24 x 15", shown in fig:120.

Problems Identified with concept 3:

Basket size: Basket size is large for 5th female

Upper basket Angle: Basket inclination is show in fig 120. All the items are collected at one end.

Visualizing problem: The height of the trolley is too big for female of 5th percentile, and it stops the vision, as the person is not able to view, the path ahead as shown is fig:121.

Foot operated: The interaction of trolley with foot is not easy as shown in fig:121

Extra handle: extra handle for lifting lower basket at is not there, as pulley handle is not at all helpful in lifting the basket as shown in fig:122



Fig 119



Fig 120



Fig 121



Fig 122

Refinement

Extra handle: Extra handle was added to the design for moving, for pulling and lifting the basket , for handling at the billing counter and for putting it inside the frame.

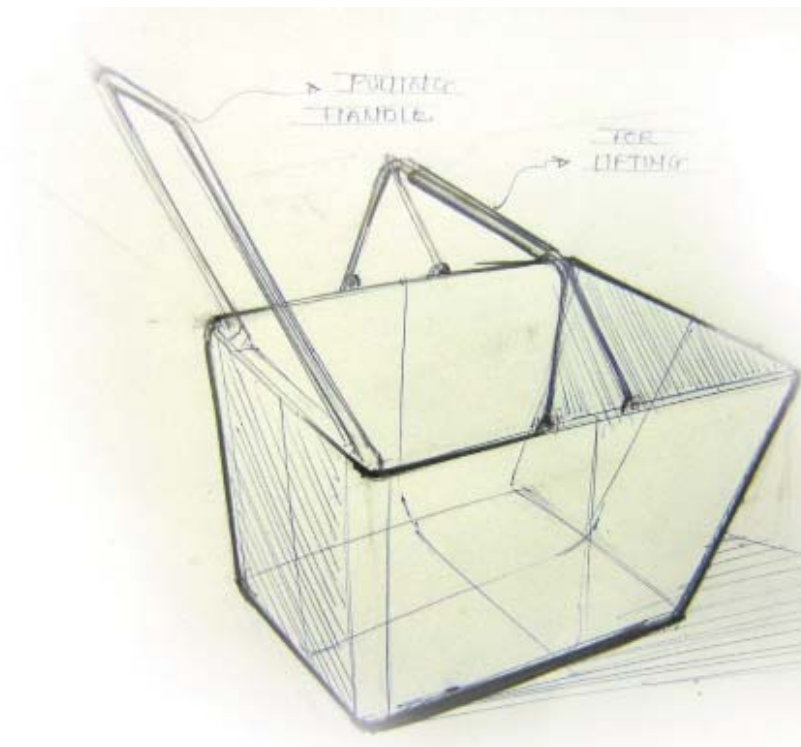


Fig 123

Refinement

Basket size: Firstly the basket size that was considered was 13 x 24 x 13". So that time basket volume was 53 liter, but the basket was too big for female, so considering this size of the trolley was re considered and the size was reduced to 13 x 18 x 10" and the volume is 33 liter. But this basket size was too small as it was just 66 liters (basket size of both the trolleys), which was lesser than the current size of 78 liters. Considering this issue, final size of the trolley is 13 x 20 x 10, but this can be further modified after more simulation.

Final dimensions of the basket is 13 x 20 x 12 and the volume is 43 liter.

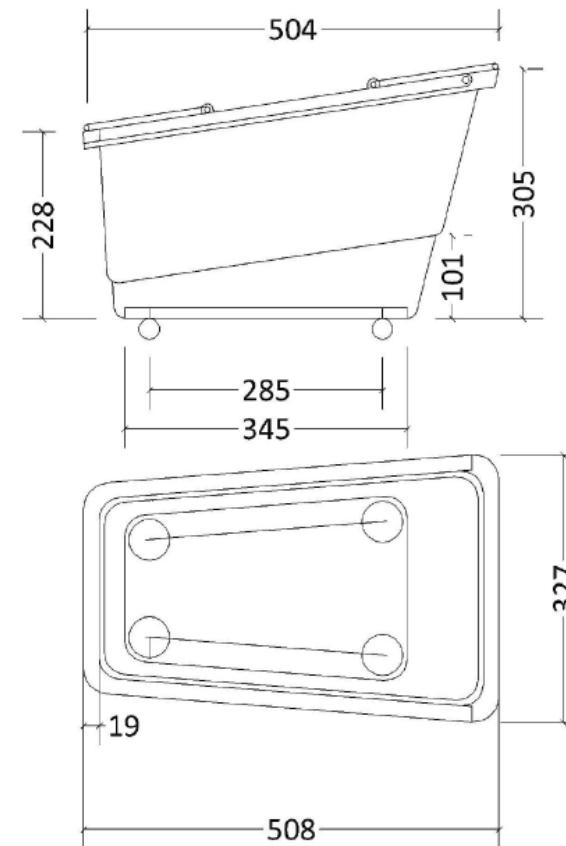


Fig 125

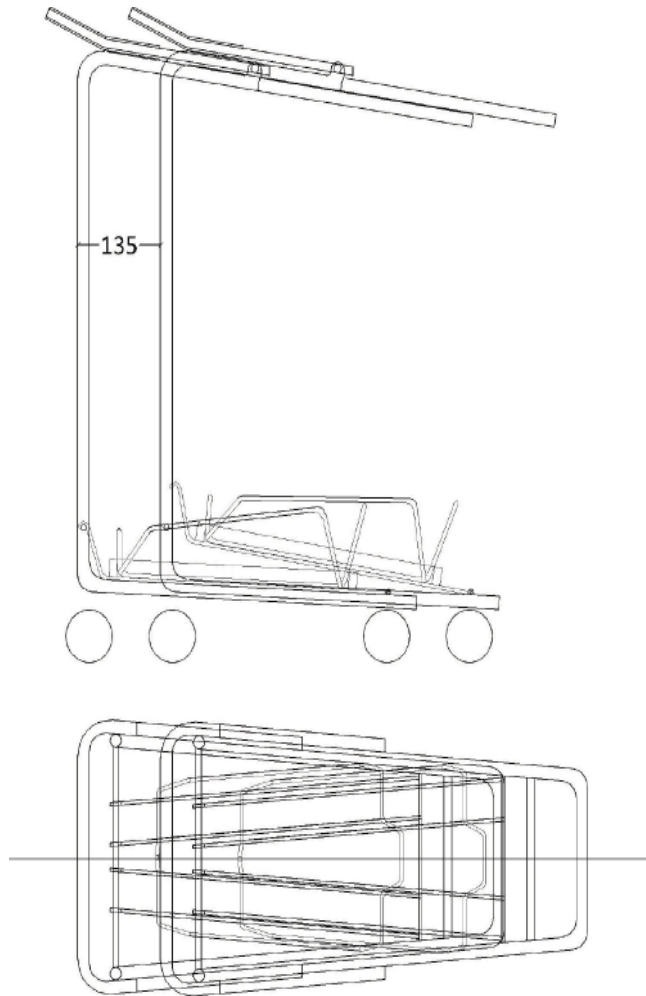


Fig 128

Refinement

Stack ability: Stack ability of frame is shown in fig 128. Frame size is 25x15". When two frames are inserted, it takes space of 6".

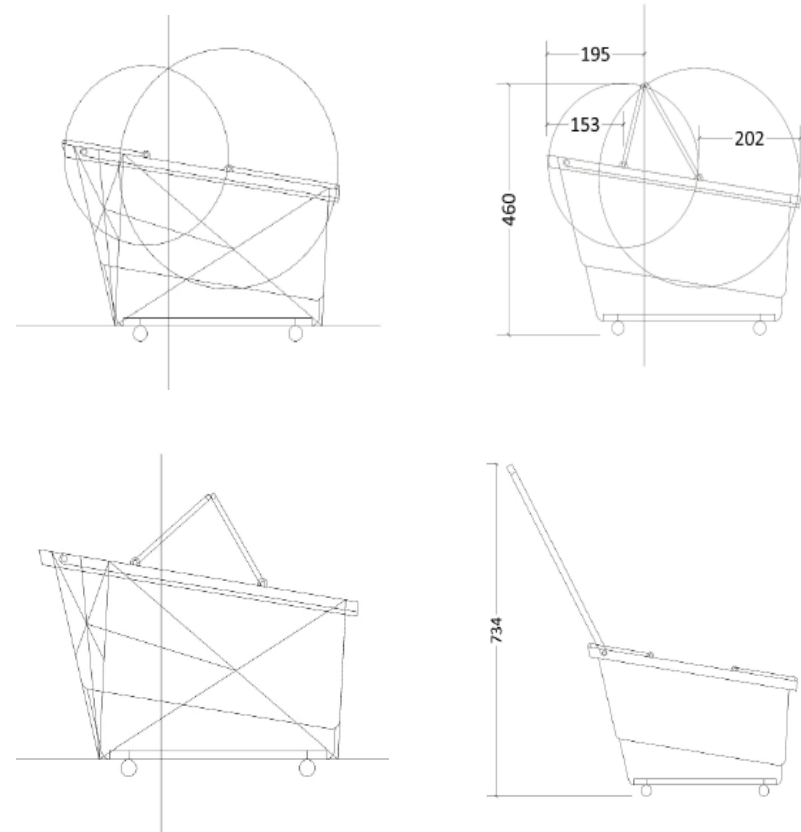


Fig 129

Refinement

Child seat: all step explain how to child seat remove as show in fig:130.

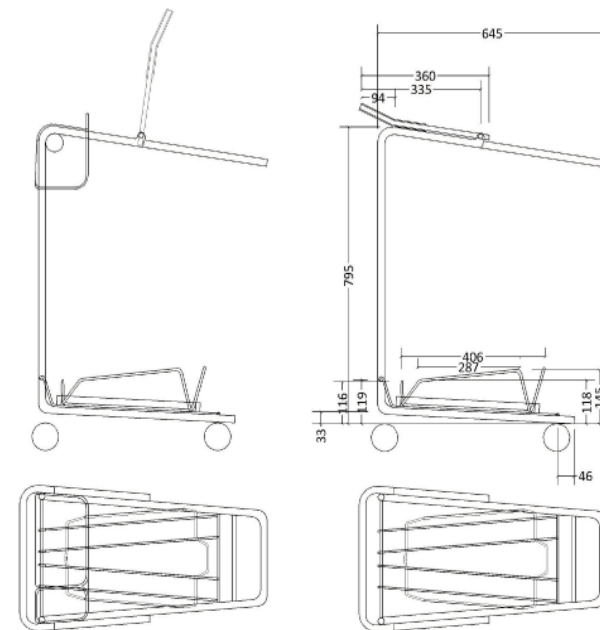


Fig 130

Refinement

Basket size: Final trolley size as show fig:131

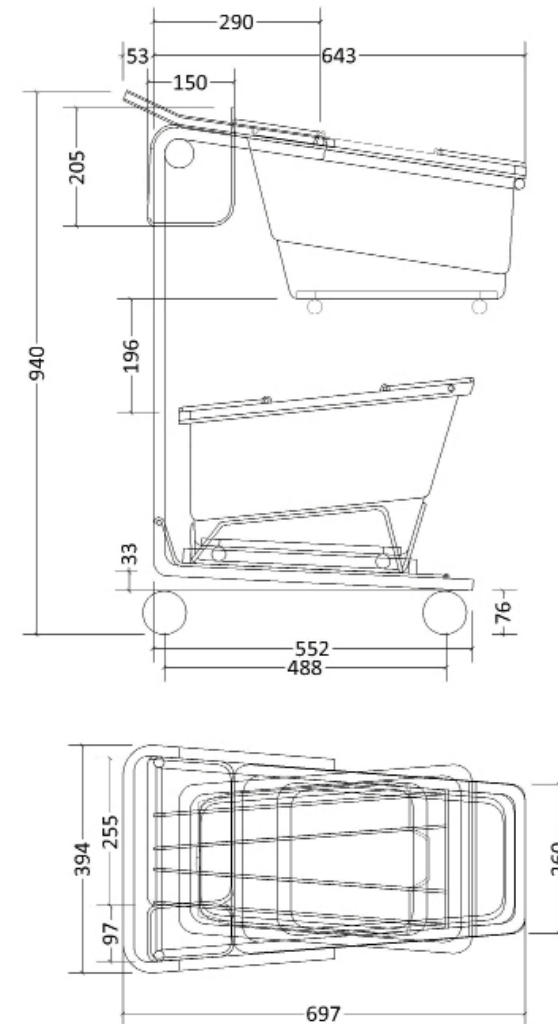


Fig 131

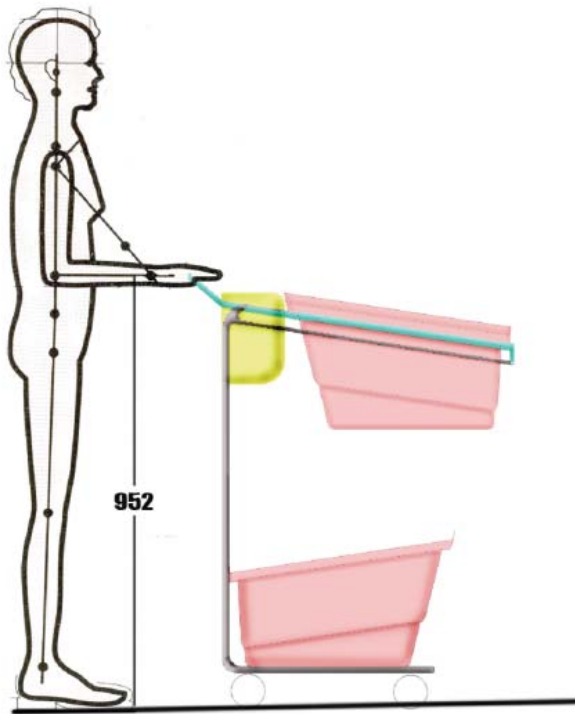


Fig 132

Refinement

Ergonomic study: Handle height should be 36" for 5th percentile female of India as shown in fig: 133 and 39" for 95th percentile male. Average handle height should be 37" for 50th percentile female.

Refinement

Basket size: Final concept Rendering



Fig 134

Final Product



Fig 135

Final Product

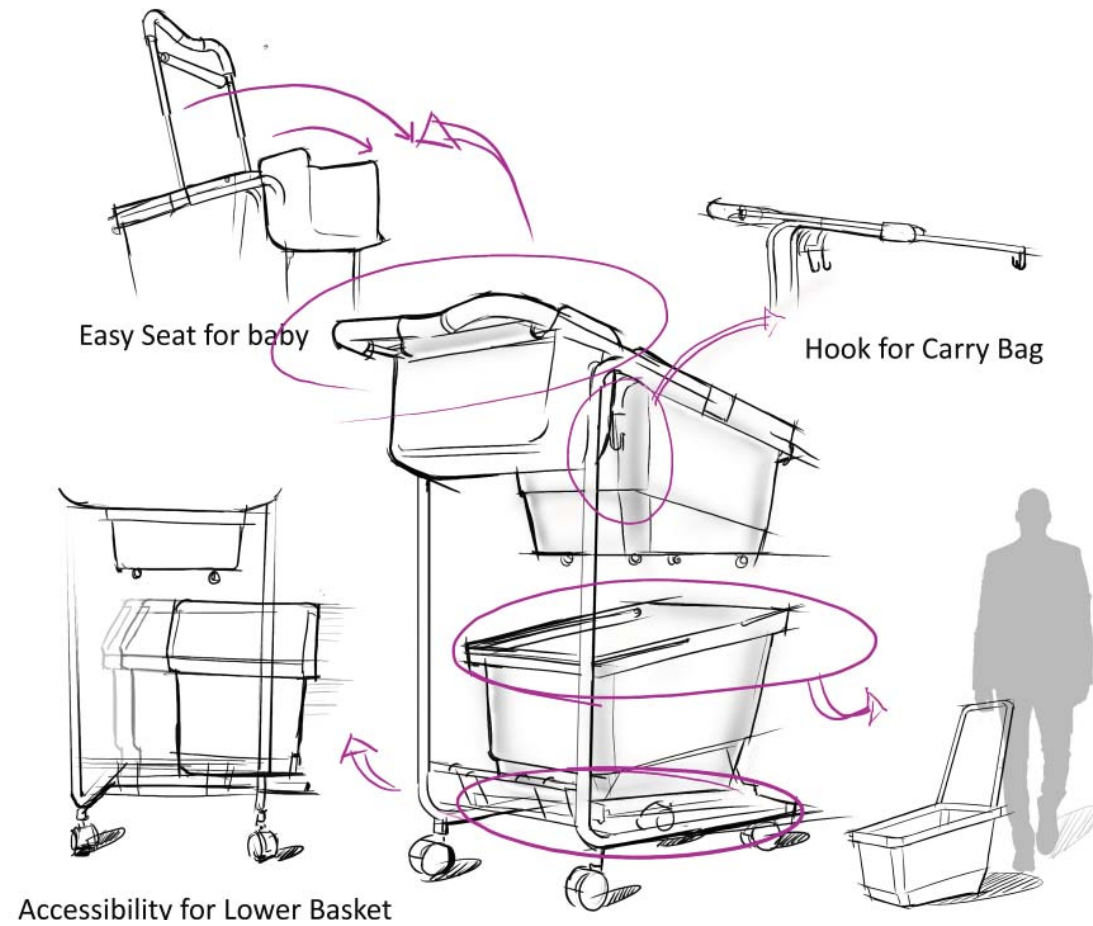


Fig 136

Final Product

Multipurpose use of trolley



Accessibility for lower basket (foot operated)



Final Product

Product features



1. Telescopic handle



2. Hook for carry bag



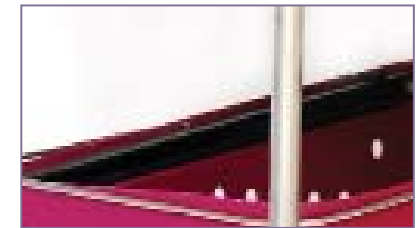
3. Wheel in basket



4. Loss base for stack ability



5. Child Seat



6. Long handle for pulling



7. Handle to Carry



8. Rail System for Accessibility

Reference

Ref 1 (Fig 2): <http://babieskids/2008/02/27/baby-shopping-cart-covers-on-sale/>
(27th feb'09, 07:30 PM)

Ref 2(Fig 3): <http://www.made-in-china.com/showroom/xxnda111/product-detailobBxXslyMzcD/China-Children-Shopping-Trolley.html>
(26th feb'09, 09:10 AM)

Ref 3(Fig 4): <http://www.amazon.com/SMALL-SUPERMARKET-GROCERY-SHOPPING-CHILDREN/dp/B000IZ4198>
(27th feb'09, 05:00 PM)

Ref 4(Fig 5): <http://www.adcoindustries.com/shoppingcarts.htm>
(27th feb'09, 07:45 PM)

Ref 5(Fig 6): http://www.littleshoppingcart.com/hand_baskets_plastic_rolling_43_liter.php
(26th feb'09, 08:30 AM)

Ref 6(Fig 9) :http://www.ares-online.com/catalog/commercial_service/4/convenience_shopper_192.html
(28th feb'09, 11:35 PM)

Ref 7(Fig 11): <http://www.essaustralia.com/services/cid/6/parent/1/pid/6/t/services/title/trolley-sales-accessories>
(27th feb'09, 12:30 PM)

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