



# Design of Innovative Shoe Rack with Seating

*M. Sc. [Engg.] Dissertation in  
Product Design*



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## 1 – Introduction

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### 1.1 Shoe Rack:

A shoe rack is a storage unit designed for holding and organising shoes. Shoe racks are also known as shoe cabinets, shoe shelves and shoe cupboards. Generally shoe rack is an independent unit built with wood or metal.

### 1.2 History:

Until the mid 1800s, shoes were handmade in small shoe-making shops by cobblers. Since shoes were either made to order or in limited quantities, cobblers had no need for significant storage space or adequate housing for shoes. As innovations in the shoe industry advanced, the invention of the sewing machine in 1846 and automated shoe-making machinery, so too did the need for a storage utility for the newly mass-produced product. <sup>[1]</sup>

Shoe boxes began as a way to store shoes sold at retail, meanwhile expensive designer shoes helped give birth to the shoe box used for storing and preserving shoes at home. Over the years, these shoe boxes gave birth to shoe racks. Shoe racks are storage utility that help manipulate space and increase organization. They can be used under beds, in closets or in any available space in open rooms. While the primary function of a shoe rack is to store and care for shoes and over long periods of time, there are many other fundamental uses for shoe boxes as well.

The world is no more the same to what it used to be, when our forefathers lived their life. It was a period when anybody hardly spent some time in thinking about the decor of their home. Now shoe rack is also an important part of house interiors.



**2.1.11: Indian Anthropometric dimensions [12]:**








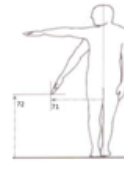

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Male	559	699	789	869	999																																																									
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Table 2.1 Human factors 1



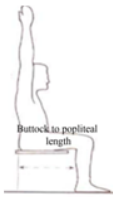

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Male	758	869	923	989	1086																					
Female	719	809	851	904	979																					
Combined	739	849	905	979	1069																					

Table2.2 Human factors2

## 2.2 Summary of Literature Survey:

- A wood with properties like close-grained, strong and durable, which takes polish are preferable for furniture manufacturing.
- Plywood, Particle board and MDF boards are widely used for various furniture's and interiors.
- Many engineered woods are available like laminated timber, laminated veneer lumber and other which is resistance to water.
- A major advantage of WPC over wood is the ability of the material to be moulded to meet almost any desired spatial conditions. It can also be bent and fixed to form strong arching curves.
- Wood working machines like universal wood working Planner, universal wood working machine, will reduce labour costs and increase the quality.
- Mortise and tenon joint and Rabbet joints are commonly used wood joints in carpentry. Dovetail joint is preferable for corner joining.
- Various types of semi finished furniture's, Hardware's and accessories are available and used according to the requirements.



### **3.4.3 Gemba study findings:**

- Users with own house go for expensive shoe cabinets or shoe benches, where as Steel shoe racks are preferred by users stay in rental house
- Shoe cabinet users need chair for wearing shoes. In small houses users take nearby chair and in big corridors separate chair is kept for this purpose
- It is observed that shoes are kept on the floor after removing it from the rack. Users bend over and wears shoes/tie lace
- Bending posture is uncomfortable for fat people, so they keep the leg on rest and tie shoe lace
- Users cannot reach shoes while they are seated on the couch in case of shoe rack with seating.








PDS of the shoe rack with seating to be designed was prepared from the QFD and is explained in the Table 3.1.

SL. No	Description	Specification
1	Part name	Shoe rack with seating
2	Area of usage	Inside the house (House entry way, corridor, Hall)
3	Target customer	Upper middle class
4	Material	Solid wood/Particle board/MDF
5	Size HxWxD	900mmX900mmX350mm
6	Storage Capacity	8 pairs
7	Installation	RTA (Ready To Assemble)
8	Ergonomics	Easy handling, Easy reach, Comfortable
9	Features	Flip down door, Drawer, Umbrella storage, Seat, Accommodates both men's and women's shoes, Easy access, Space for socks& shoe polish, extra storage space and Leg rest

**Table3.1 PDS**



criteria were entirely based upon aesthetics and design features. Concept 2 has been selected as the final concept according to the total score obtained (Refer table5.1).

Concept Scoring		Concept 1		Concept 2		Concept 3		Concept 4		Concept 5	
											
Criteria	Weightage	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Usability	25%	4	1.0	5	1.25	4	1.0	3	0.75	3	0.75
Aesthetics	30%	3	0.9	5	1.5	5	1.5	4	1.2	4	1.2
Reliability	20%	4	0.8	4	0.8	4	0.8	3	0.6	4	0.8
Features	15%	4	0.6	5	0.75	2	0.3	4	0.6	3	0.45
Maintenance	10%	3	0.3	4	0.4	3	0.3	3	0.3	3	0.3
<b>Total Score</b>		3.60		4.70		3.90		3.45		3.50	
<b>Ranking</b>		3		1		2		5		4	
<b>Decision</b>		Discard		Develop		Discard		Discard		Discard	

**Table5.1 Ranking method**

### 5.8.1 Selected concept:

Concept 2 had been selected for development



**Figure5.14 Selected concept**





Figure6.3 Final concept views

### 6.3 Concept Detailing with Material Specification finish:

The materials that are to be used for the manufacturing of the shoe rack was decided based on the ease of manufacture, cost and usability.



Figure6.4 surface finish

## 6.5 Prototype Model:

Final assembly of the prototype model is shown in the figure6.7



Figure6.7 Prototype model

## 7. Validation

### 7.1 Introduction:

Validation of the final concept was done to ensure the potential of the design. Prototype model was developed to validate the proportions and surfaces of the design. Manufacturability of the concept also was validated through the prototype model. The final prototype model was produced in front of users. Their opinion and suggestions for improvement were documented.

### 7.2 Final concept validation:

Ergonomics, Aesthetics and Usability these three major parameters are considered for validation of the final concept. Feedbacks from users are mentioned below:



Furniture show room owner

- Very good concept, innovative design
- Glass shelf could be added on the top of the cabinet.



- Quite useful design with many features
- Weight could be reduced using thin wood sections
- Front opening in the seat can be changed to backwards
- Aesthetically appealing
- Wheel movement could be made smoother.



## 8. Conclusion

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### 8.1 Summary:

The whole work of the project was summarized as follows:

- Secondary research method like literature review was conducted on shoe racks by referring magazines, journals, manuals, publications, websites etc
- Data collection was done by product study, user study and market study through ethnography, interviews, images, videos etc
- QFD was prepared using the data collected during the research and the needs identified
- Then the target PDS was arrived a based on the QFD
- Concepts were generated using the ideation tools like brainstorming, Mind mapping etc
- From those concepts 5 concepts were selected and they were digitized using software's like Photoshop, Pro E etc
- A final concept was then selected from these five concepts using weighted ranking method
- Detailed drawing of the concept was prepared
- Prototype model was made using pre laminated particle board, sun board etc.

### 8.2 Conclusion:

An innovative shoe rack with seating is designed with the help of user study data's. A prototype model is made which is aesthetically well pleasing and is appreciated by many people. Works mentioned for the future will be completed soon.

This project has given the opportunity to learn the new product design and development process in an organization. This project has helped to enrich knowledge about complete product design process. It has been a wonderful experience to work as an individual designer in an organisation.