IDC School of Design
अभिकल्प विद्यालय

Project 2

Designing mobile workstation for people working from home

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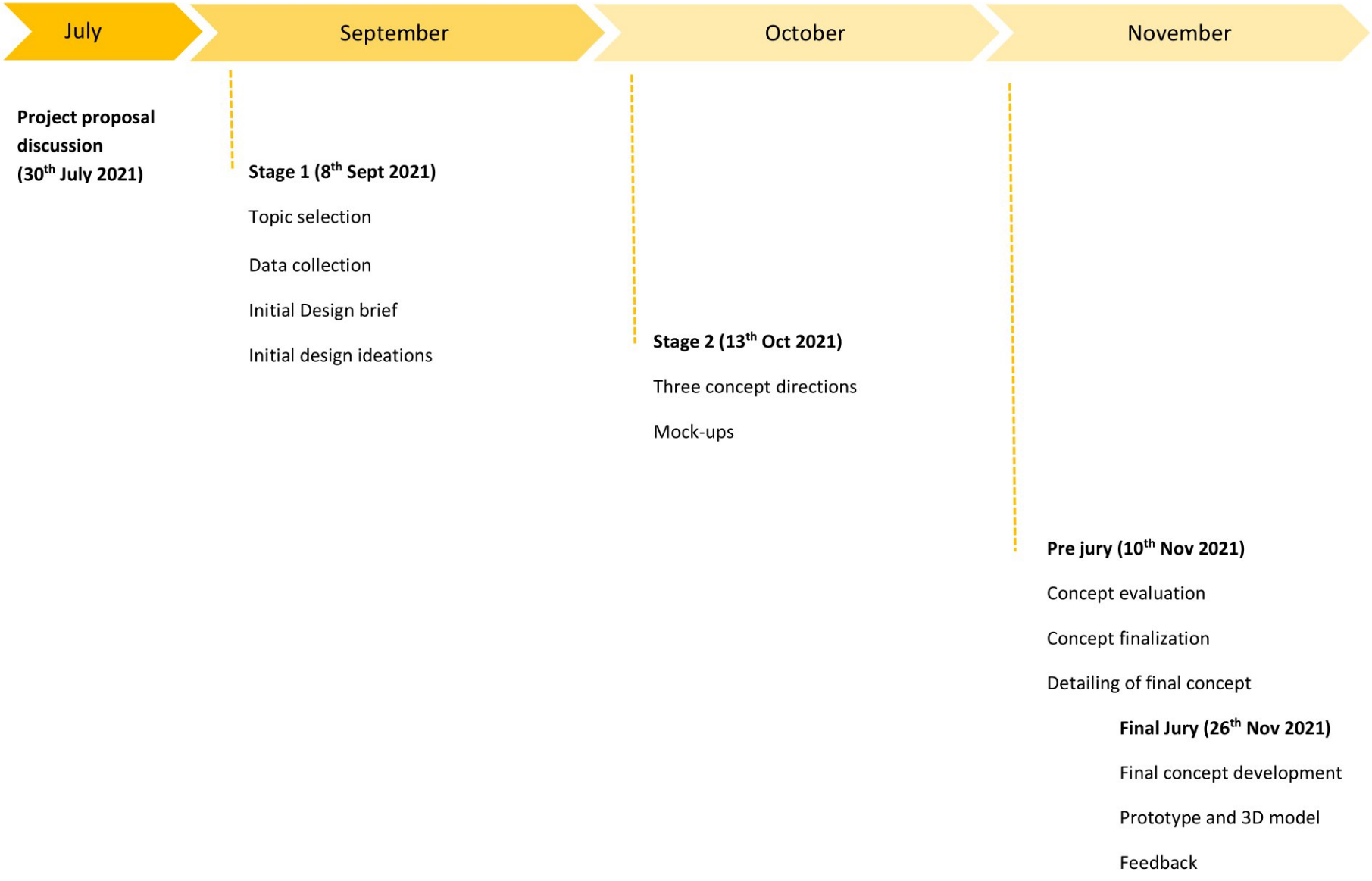
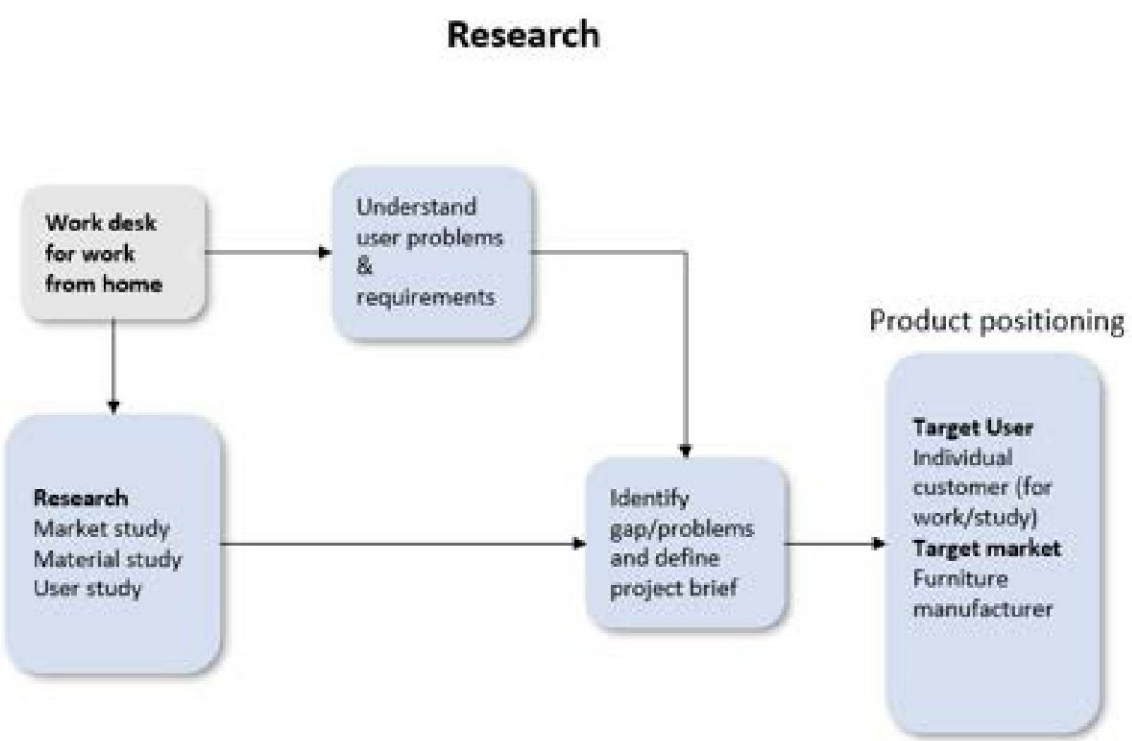
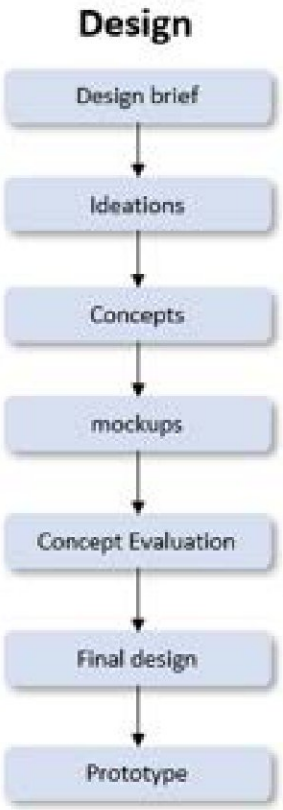


2. METHODOLOGY





3. INRODUCTION

In march 2020, India hit pandemic and with the effect of lock down many people started working from home. IT industry, students' education and other activities everything was bound to be done at home. Some of these professions includes long sitting hours for work which causes various issues. Apart from that isolation, movement restrictions, metal health issues started accelerating for people working from home. This project is taken up in order to solve different challenges and struggle faced by people working from home to make their work life better, to reduce mental and physical stress, happy and productive

Target market

Furniture manufacturer

Target user

- **Primary user** – People working from home
- **Secondary user** - everyone else who require desktop to work or study from home

IT professionals

Students

Others

4. LITERATURE STUDY

4.1. WHAT IS WORK DESK?

A dedicated space that is used to work, keep one focused, comfortable and productive throughout the day. It is also a place to keep stationery and other important work-related documents organised and accessible.

4.2. WHY IS IT AN ESSENTIAL FURNITURE?

Every furniture has a specific role to play and so is work desk. It is essential as it provides focused yet comfortable work environment to user, provides better work posture with ergonomically designed table hence reducing injuries and keep things organised hence making clutter free clean work space.

4.3. WHY IS REDESIGN REQUIRED?

Since many people have started to work from home due to pandemic, managing both work and daily house task with the added responsibility of may be family members or self-care or extra precautionary steps or mental peace has become difficult. It was noticed that IT sector completely shifted to work from home and is planning to continue work from home even after pandemic to some extent. People have adapted to different ways of working at home and are facing different challenges with this shift and through this project I am trying to solve their problems by designing wholesome work desk to fulfil user requirement.

The project explores on various possibilities to make work desk more functional, usable, accessible, portable in work from home scenario by IT professionals.

5. RESEARCH

5.1. MARKET STUDY

5.1.1. EXISTING TABLES IN MARKET

Here are few references of the existing tables found on online store to understand and analyse what exists and where the gap lies for better design of table.

Fig1. is an example of existing work table found on Pepperfry online store

Fig.1

Insights gained:

- No adjustment
- No separate space for food package placement
- No inbuilt task board

https://www.pepperfry.com/guide-computer-table-in-exotic-teak-finish-by-a-globia-creations-1853886.html?type=clip&pos=34:1&cat=1916&total_result=655&variation_id=209437

Example 2 of existing work table found on homecentre online store

Style: contemporary
Material : Engineered wood
Finish: Melamine
Dimensions : W 120 cm x D 40 cm x H 120 cm

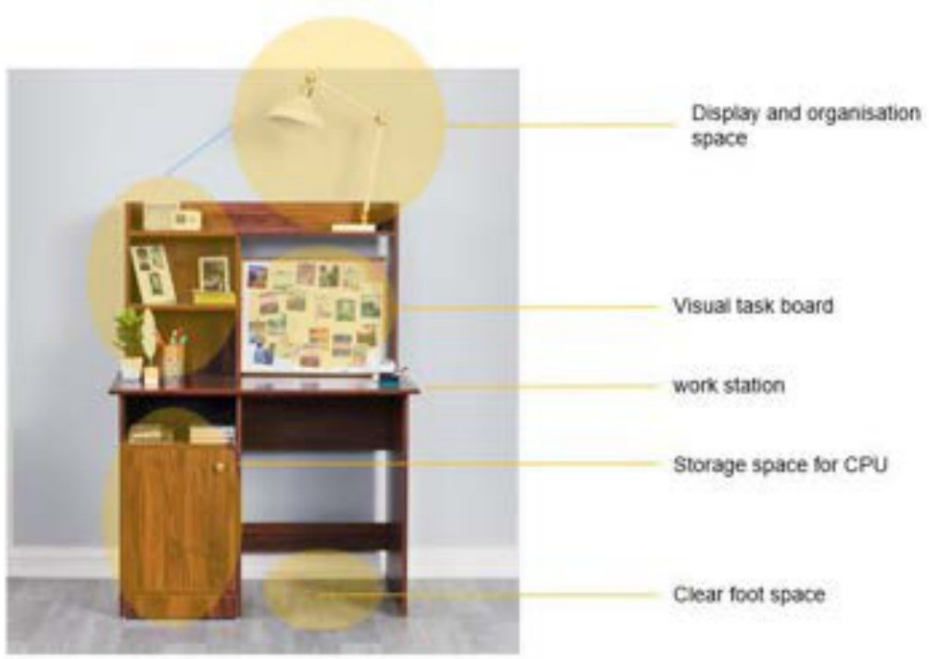
Price : INR **14,735**

Insights gained:

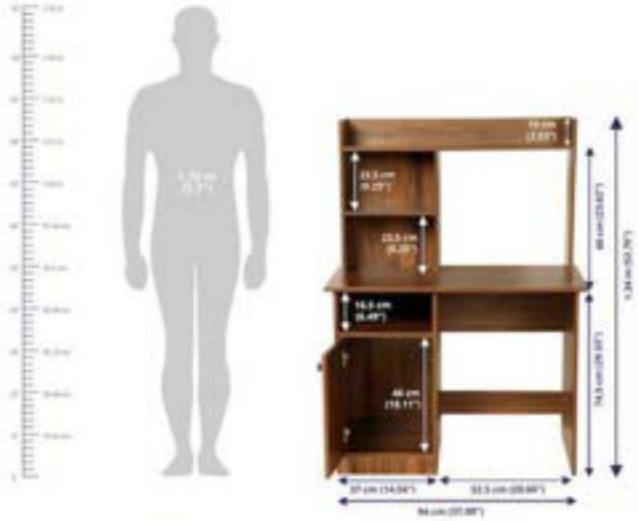
- No space for CPU and desktop
- No adjustment

https://www.homecentre.in/in/en/Home-Office/Home-Office-Tables/Computer-Tables/HOMECENTRE-HELIOS-Darice-Walnut-Engineered-Wood-Study-Table--120-x-40-x-120-cm/p/1000010207582

Example 3 of existing work table found on homecentre online store



Style: contemporary
Material : Engineered wood
Finish: Melamine
Dimensions : W 120 cm x D 40 cm x H 120 cm



Price : INR **14,735**

Insights gained:

- Visual task board can hide with laptop screen
- No adjustment – fixed design

https://www.homecentre.in/in/en/Home-Office/Home-Office-Tables/Computer-Tables/HOMECENTRE-HELIOS-Darice-Walnut-Engineered-Wood-Study-Table--120-x-40-x-120-cm/p/1000010207582

Example 4 of existing work table found on homecentre online store

Style: contemporary
Material : Engineered wood and cast iron frame coated with paint
Finish: Melamine
Dimensions : W 50 cm x D 30 cm x H 64 cm

Cost: INR **5,450**

- No adjustment
- Space may not be sufficient to keep all other products needed

https://www.homecentre.in/in/en/Home-Office/Home-Office-Tables/Work-Tables/HOMECENTRE-Helios-Solid-Brown-Engineered-Wood-Work-From-Home-Table-with-USB-Socket/p/1000010317289

5.1.2. STYLES OF FURNITURE

Traditional furniture

Main characteristics of this style are simplicity, elegance, curved lines, classic silhouettes in wood, colours used are rich shades of brown. Intricate details on the wood are part of its style. Image below shows is an example of traditional furniture.

https://www.cymax.com/Steve-Silver-Antoinette-Coffee-Table-AY150C.htm

https://www.bassettfurniture.com/blog/what-is-traditional-furniture.aspx

Modern furniture

These types of furniture are characterised by simple and crip lines without much ornamental details. Mostly neutral colours are used and a wide variety of materials are used like wood, glass, metal, plastic and other composite materials. Modern design grows with the time and tend.

Mid-century modern

It is defined as collection of most iconic modern design from the 1933 to 1965. The style is characterised by fine and sophisticated line, simple and few details following neutral colour palette. Most popular material used is natural wood with natural wood finish of pine, walnut, maple finishes.

Contemporary style

It is characterised by fluid geometry and curved lines based on present time. Wide range of materials are used for construction.

5.1.3. MATERIAL STUDY OF FURNITURE

There are variety of materials available these days from natural wood to technically sound man-made wood which can be used for various types of furniture making depending on the structure and requirement.

Apart from wood there are other materials that are widely used in the furniture industry for various different parts like metal, plastic or any other composite material.

Use of material in any furniture depends on the following factors, Strength, movement in furniture, durability, hardware, style of furniture, preference.

Natural wood

Natural wood is a very strong material for furniture manufacturing as it is a sustainable material, texture and wood grains make the overall look pleasing and also the natural colour. The only limitations at some places are due to its effect of shrink when dried and swell in moist atmospheric conditions. There has to be some allowance to be given while construction of the furniture.

Although furniture made using natural wood gives a premium look to the space and reflects personality but there is a lot wastage that happens in its construction in the form saw dust and wooden shaves.

https://www.fs.fed.us/ne/newtown_square/publications/research_papers/pdfs/scanned/OCR/ne_rp600.pdf

Plastic

Plastic as a material for furniture manufacturing is not cheap, rather a high-quality plastic has a lot of benefits over other materials. It is low maintenance, rust free, easy to clean, mouldable in any form

https://www.researchgate.net/publication/341641258_Usage_Of_Plastic_Wastes_in_Furniture_Production_Three_Dimensional_3D_Printing_Technologies

https://www.academia.edu/38376286/USE_OF_PLASTIC_MATERIALS_IN_FURNITURE_DESIGN_pdf

5.1.4. MANUFACTURING PROCESS

For different material the manufacturing process varies. Many furniture is combination of metal, glass, plastic, rattan and wood so each stage of manufacturing is different. At the end everything is assembled to form a single piece of furniture.

Wooden furniture

For wooden furniture, the processes involved are cutting, bending, moulding, laminating, finishes, painting or polishing and assembling different parts with the help of joinery and adhesive.

Cutting

Bending

moulding

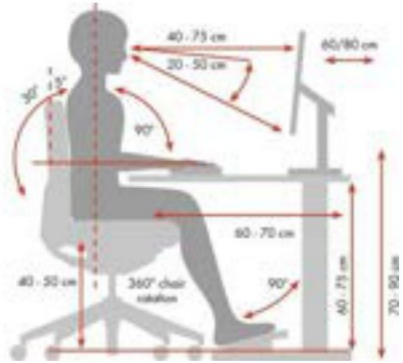
Plastic furniture

Most of the plastic furniture like table, chair etc are made using injection molding process. And the initial step involved is the 3d drawing of the product and then followed by making the mold.

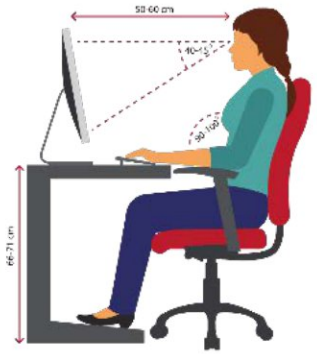
5.1.5. ANTHROPOMETRIC STUDY OF FURNITURE

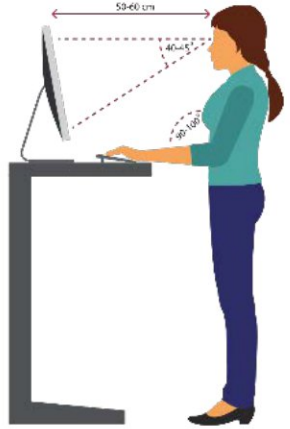
The standard height for a study desk/table is considered to be **26'' - 30''**

The average height bracket of people is considered to be ranging between **5'8''-5'10''**



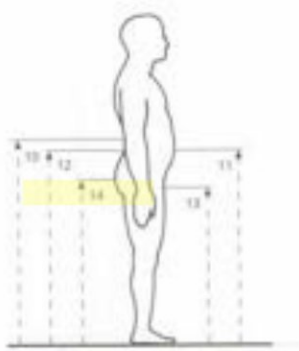
From the above figure we can understand the foot clearance, height of table top from the ground, vision distance from the computer screen which will help in deciding the dimensions of the table



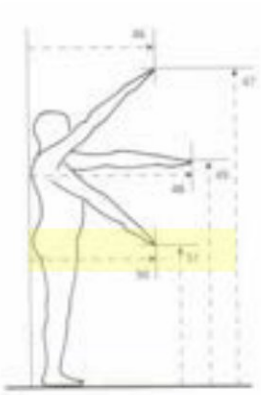


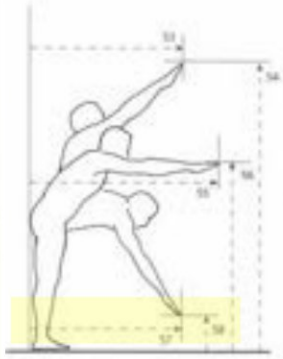
The above image shows the vision distance in sitting and standing posture of working on a desk. It is recommended by ergonomists that a n active movement should be maintained in average eight-hour workday. A dynamic way of working is always recommended. While sitting posture give user back support and comfort during work, standing posture in between helps your body circulate blood more effectively and gives your body an opportunity to stretch which is very important.

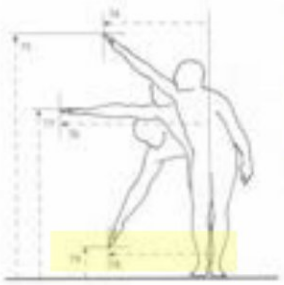
All the anthropometric data is taken from the book “Dev Kumar Chakraborty- Anthropometry Data”, showing data with respect to Indian male and female body dimensions.



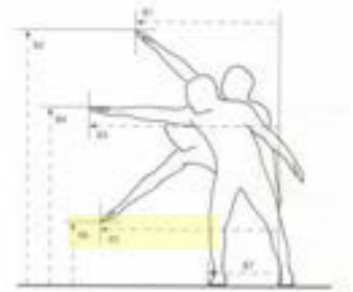
R.No.	Parameters		Min	Percentiles					Max	Mean	±SD
				5th	25th	50th	75th	95th			
10	**Elbow**	Male	791	945	1003	1039	1072	1123	1405	1038	56
		Female	808	879	923	953	989	1039	1202	956	50
		Combined	791	908	970	1022	1061	1115	1405	1018	65
11	**Abdominal extension**	Male	705	925	977	1015	1050	1110	1345	1016	59
		Female	813	829	857	900	942	1019	1155	908	62
		Combined	795	881	965	1009	1047	1109	1345	1005	67
12	**Waist**	Male	819	894	935	970	1005	1053	1170	972	51
		Female	746	839	893	931	970	1027	1046	931	56
		Combined	746	875	927	965	1000	1047	1170	963	55



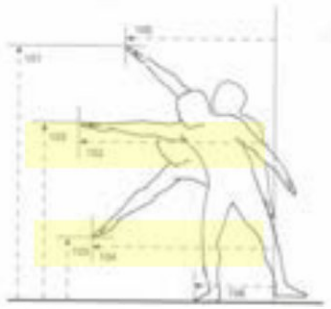




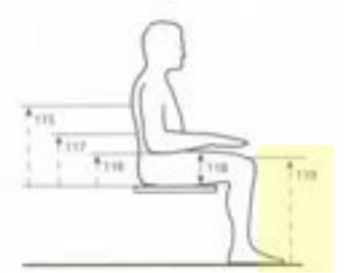
R.No.	Parameters		Min.	Percentiles					Max.	Mean	±SD	Ratio
				5th	25th	50th	75th	95th				
74	Upper position length	Male	430	629	749	859	919	1029	1250	837	136	0.51
		Female	320	470	659	769	859	979	1150	754	152	0.49
		Combined	320	549	729	809	899	1019	1250	819	140	0.51
75	Upper position height	Male	1830	1499	1629	1729	1809	1949	2150	1724	136	1.05
		Female	1520	1359	1559	1669	1759	1869	1980	1650	132	1.08
		Combined	1520	1469	1619	1719	1799	1939	2150	1708	145	1.05
76	Mid position length	Male	760	859	954	1019	1089	1189	1370	1024	103	0.62
		Female	600	769	859	919	984	1099	1260	918	93	0.6
		Combined	600	829	929	999	1070	1189	1370	1004	109	0.62
77	Mid position height	Male	990	1059	1169	1229	1309	1419	1640	1235	111	0.73
		Female	780	869	1019	1129	1199	1309	1880	1140	100	0.74
		Combined	780	969	1139	1219	1299	1419	1880	1219	140	0.73
78	Lower position length	Male	630	559	639	709	869	969	1110	782	136	0.48
		Female	440	499	619	719	799	969	1140	773	137	0.47
		Combined	440	549	669	759	869	989	1140	798	139	0.47
79	Lower position height	Male	0	49	219	329	399	559	1120	509	254	0.31
		Female	0	9	279	459	600	809	1300	667	254	0.3
		Combined	0	49	319	379	480	809	1300	600	298	0.31
80	Sideways mid position grasp reach length (leaning sideways)	Male	715	821	875	939	999	1205	1180	936	92	0.56
		Female	670	711	781	825	865	924	930	825	60	0.54
		Combined	670	759	845	909	988	1045	1180	911	97	0.56

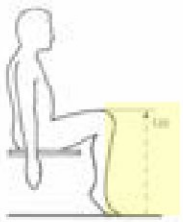


R.No.	Parameters		Min.	Percentiles					Max.	Mean	±SD	Ratio
				5th	25th	50th	75th	95th				
81	Upper position length	Male	630	839	999	1099	1219	1399	1620	1110	170	0.68
		Female	530	589	819	819	1069	1219	1280	930	183	0.61
		Combined	630	769	959	1079	1199	1369	1620	1014	187	0.66
82	Upper position height	Male	1460	1479	1599	1694	1799	1929	2165	1731	159	1.03
		Female	1060	1389	1529	1649	1759	1929	2015	1655	162	1.08
		Combined	1060	1469	1594	1689	1799	1929	2160	1692	167	1.04
83	Mid position length	Male	850	1069	1209	1309	1409	1619	2020	1316	160	0.8
		Female	870	939	1069	1139	1239	1354	1430	1146	124	0.75
		Combined	870	1019	1169	1219	1389	1569	2020	1262	168	0.79
84	Mid position height	Male	630	899	1129	1209	1289	1399	1675	1257	136	0.73
		Female	770	869	1049	1149	1219	1449	1520	1141	162	0.74
		Combined	630	959	1109	1199	1279	1399	1675	1193	155	0.74
85	Lower position length	Male	630	879	1019	1129	1249	1439	1490	1141	182	0.69
		Female	430	709	869	969	1099	1229	1430	966	171	0.63
		Combined	430	789	979	1109	1219	1419	1490	1106	193	0.68
86	Lower position height	Male	0	19	229	459	729	959	1320	675	288	0.29
		Female	0	0	209	359	569	809	1170	595	258	0.26
		Combined	0	9	229	449	699	889	1320	459	284	0.28
87	Sideways step length	male	300	429	549	669	779	929	1140	671	157	0.41
		female	240	359	479	549	629	699	800	545	103	0.36
		Combined	300	409	529	629	749	909	1140	647	156	0.4



R.No.	Parameters		Min.	Percentiles					Max.	Mean	±SD	Ratio
				5th	25th	50th	75th	95th				
101	Upper position length	male	450	559	665	879	1059	1239	1680	972	174	0.58
		Female	390	519	719	809	959	1139	1250	833	179	0.54
		Combined	390	639	839	959	1049	1239	1680	943	184	0.58
102	Upper position height	Male	1180	1499	1634	1739	1819	1969	2180	1729	147	1.05
		Female	830	1339	1569	1699	1799	1929	1910	1633	165	1.06
		Combined	830	1489	1619	1739	1869	1969	2180	1709	194	1.05
103	Mid position length	male	780	959	1069	1199	1259	1419	1720	1166	163	0.71
		Female	470	769	909	1019	1089	1259	1390	1007	145	0.66
		Combined	470	869	1009	1129	1189	1419	1720	1134	171	0.7
104	Mid position height	Male	660	1029	1159	1249	1329	1459	1840	1241	146	0.75
		Female	610	929	1079	1169	1259	1459	1530	1155	165	0.75
		Combined	610	969	1129	1229	1319	1459	1840	1223	156	0.75
105	Lower position length	Male	660	699	859	969	1069	1259	1520	999	170	0.59
		Female	520	599	689	819	909	999	1180	852	145	0.52
		Combined	520	649	809	919	1039	1259	1520	935	179	0.58
106	Lower position height	Male	0	79	339	559	759	979	1290	695	259	0.32
		Female	50	89	284	449	599	809	920	644	221	0.29
		Combined	0	79	319	519	719	899	1290	516	255	0.32
107	Step length backwards	Male	260	349	449	529	649	789	1090	552	141	0.34
		Female	240	279	379	459	529	609	720	449	102	0.29
		Combined	240	319	429	519	619	789	1090	501	140	0.33

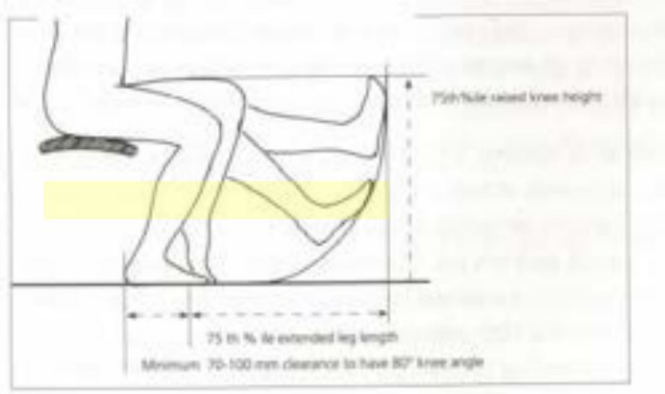




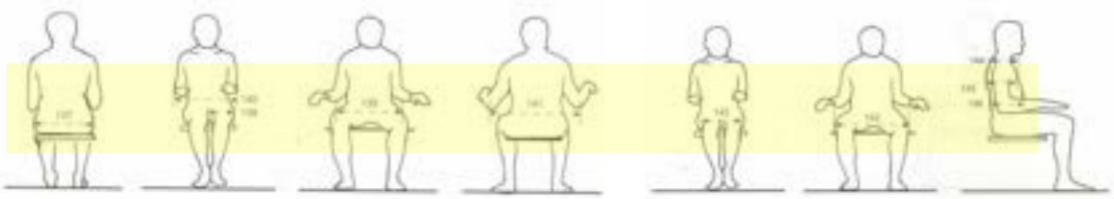
R.No.	Parameters		Min	Percentiles					Max	Mean	±SD	Ratio
				5th	25th	50th	75th	95th				
116	**Tip of shoulder blade**	Male	441	373	399	417	442	478	665	423	32	0.29
		Female	231	303	351	364	385	419	448	367	36	0.24
		Combined	231	350	389	411	437	470	665	412	39	0.25
118	**Elbow rest**	Male	112	158	192	213	236	270	335	215	34	0.13
		Female	102	124	170	194	218	265	290	195	34	0.13
		Combined	102	150	188	210	234	268	335	211	36	0.13
117	**Waist**	Male	102	154	173	188	196	221	327	185	24	0.11
		Female	136	163	184	204	221	249	281	207	28	0.14
		Combined	102	157	176	188	203	231	327	192	26	0.12
116	**Mid-thigh**	Male	85	96	116	127	140	158	226	129	18	0.08
		Female	78	85	100	109	124	154	212	114	24	0.07
		Combined	85	89	106	124	137	158	226	125	22	0.08
119	**Knee**	Male	438	472	497	514	536	561	652	520	30	0.32
		Female	412	440	462	484	499	520	578	480	28	0.32
		Combined	412	456	489	508	534	563	652	511	33	0.32

R.No.	Parameters	Definition (brief)
120	**Thigh clearance ht. with raised knee**	Highest point on the knee (at lower thigh), when the leg is raised upward to the maximum supported on the toes.

R.No.	Parameters		Min	Percentiles					Max	Mean	±SD	Ratio
				5th	25th	50th	75th	95th				
128	**Buttock to leg length, normal sitting**	Male	639	640	654	719	776	776	780	690	56	0.42
		Female	539	540	576	639	729	758	760	651	75	0.42
		Combined	539	540	594	654	729	779	780	664	73	0.42
129	**Buttock to leg length while raised on toe**	Male	520	569	599	659	696	769	960	658	68	0.4
		Female	450	559	639	683	688	718	760	655	61	0.43
		Combined	450	559	609	659	688	759	960	657	67	0.41
130	**Buttock to extended (rested on floor) leg comfortable length**	Male	685	758	869	923	989	1086	1210	926	98	0.56
		Female	660	719	805	851	904	979	1066	852	78	0.56
		Combined	660	739	840	905	979	1069	1210	910	99	0.56
131	**Buttock to leg full extended length**	Male	870	971	1039	1088	1133	1209	1350	1088	72	0.68
		Female	860	910	964	999	1035	1106	1310	1005	64	0.68
		Combined	865	941	1019	1071	1115	1199	1350	1071	78	0.66



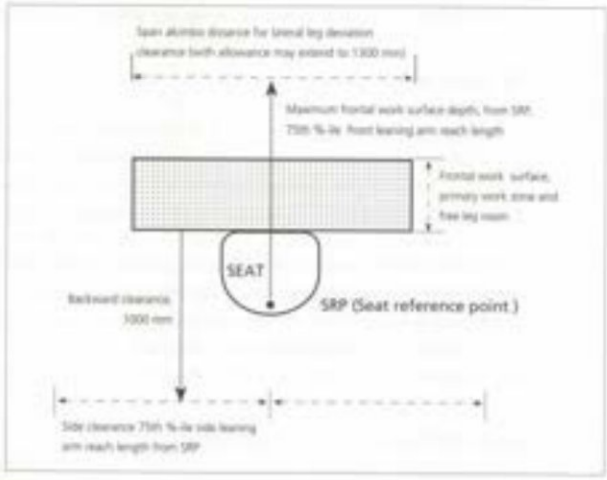
Leg clearance: **1069 mm**



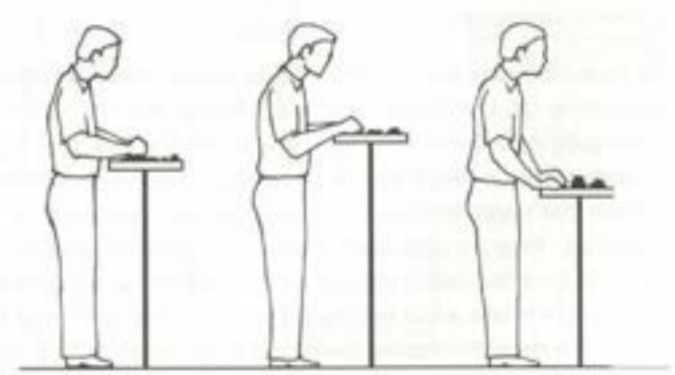
R.No.	Parameters		Min	Percentiles 5th	25th	50th	75th	95th	Max	Mean	±SD	Ratio
137	Hip	Male	209	272	309	331	355	405	550	334	43	0.2
		Female	220	259	296	314	341	429	520	323	49	0.21
		Combined	209	269	304	326	353	408	550	331	45	0.2
138	Thigh (middle) external breadth, single	Male	82	99	116	129	142	164	204	131	20	0.08
		Female	53	75	96	105	116	136	145	107	16	0.07
		Combined	53	84	109	125	139	162	204	127	22	0.08
139	Mid thigh-to thigh external breadth (relaxed)	Male	285	289	339	369	399	449	490	373	50	0.23
		Female	273	274	309	379	394	529	530	363	67	0.24
		Combined	273	289	334	369	394	479	530	371	54	0.23
140	Elbow to elbow (closed)	Male	296	346	375	409	435	489	746	411	47	0.25
		Female	257	282	325	364	399	435	510	383	50	0.24
		Combined	257	311	366	396	430	479	746	398	52	0.25
141	Elbow to elbow (relaxed)	Male	330	424	464	505	549	644	821	514	71	0.31
		Female	340	352	395	439	474	572	587	444	61	0.29
		Combined	330	389	451	494	539	632	821	501	74	0.31

R.No.	Parameters		Min	Percentiles 5th	25th	50th	75th	95th	Max	Mean	±SD	Ratio
142	Knee to knee (closed)	Male	160	166	181	192	204	235	360	197	24	0.12
		Female	138	143	163	174	190	259	274	182	30	0.12
		Combined	138	159	177	189	201	243	360	193	26	0.12
143	Knee to knee (relaxed)	Male	220	284	339	388	438	535	677	395	76	0.24
		Female	191	225	262	298	339	410	681	307	65	0.2
		Combined	191	252	314	369	419	529	681	375	82	0.23
144	Chest, on bust	Male	157	181	196	209	227	254	425	215	28	0.13
		Female	158	171	191	207	287	315	333	217	37	0.14
		Combined	157	179	195	209	229	260	425	215	30	0.13
145	Chest, below bust	Male	156	167	186	201	220	247	416	205	28	0.12
		Female	148	147	162	183	212	235	294	189	33	0.12
		Combined	148	164	183	199	219	247	416	203	29	0.12
146	Abdomen	Male	102	166	191	217	251	302	518	224	46	0.14
		Female	144	155	167	191	212	332	395	201	47	0.13
		Combined	102	164	187	210	245	302	518	221	47	0.14

Seating space consideration for work



Preferred height for standing work surface: **elbow height(1115mm) + (50 – 200mm)**

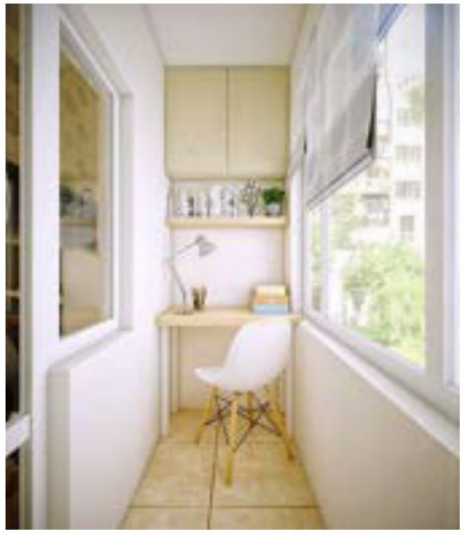


5.1.6. DIFFERENT SPACE STUDY

one of the common spaces found in the houses where a table can be placed is against the wall. In this case our eyes are bound to see the wall and whatever is there on the wall. Such walls give you vertical space to work with and since both the sides of table space is free, it can be utilized for different organization purpose.

Another common place in houses is the corner space against the wall to setup the work desk. In such scenario, one side of the table space is blocked but one side is free which can be utilised. Also the table shown in the image is a compact one which points out for better management of products over the table and within practical reach.

Another not so common space in the house is in front of window. This seems to be a good location but not everyone has the joy of keeping their table here. This scenario gives eye a distant sight while working in front of computer since we can see what's going on out, feel the fresh air and light. It makes the day less stressful as compared to other scenarios. The only constraint I feel over here is the utilization of vertical space since we have window in front so vertical space to certain extent is possible. Bringing nature close to people desk might help them cope up with work from home environment and keep them more productive and less stressed.



Some of the alternatives people are following is by creating a work space in covered balcony or passage area. This is a great space I believe since it gives you a separate space to work in and also one can outside view to lighten up the day. But in this scenario the dimension of space may vary and thus the universal dimension of table might not fit here and there might also be some constraints with utilizing the side space of the table.

5.1.7. ANALYSIS

After above study and understanding various factors and constraints, there is need for a universal **modular design** which can fit in most of the spaces in our houses and give **freedom to user to select accessories** as per their requirement. Also, in some scenarios user might feel trapped since there is no outside vision, so **addition of nature** in some way would help lift the mood of user while working.

Increasing the capacity of compact space to its full potential will be great way to manage and organize resources thus there is need of good modular organizers.

5.2. USER STUDY

5.2.1. DEFINE USER PROFILE

Name: Mr. Subhash Muthukumar

Gender: Male

Occupation: Software engineer

Location: Mysore

Work: From home

IT PROFESSIONAL

Subhash is a project manager.

His work includes lots of meetings and management task over video/audio call.

Attending back-to-back meeting sitting in one position causes backaches for him.

He likes to go for cycling but due to long working hours he is bound to sit and work at home.

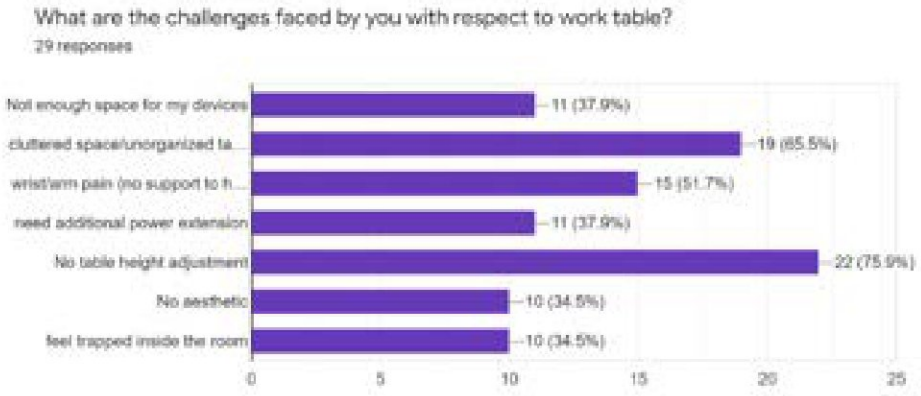
5.2.2. INTERVIEW QUESTIONNAIRE

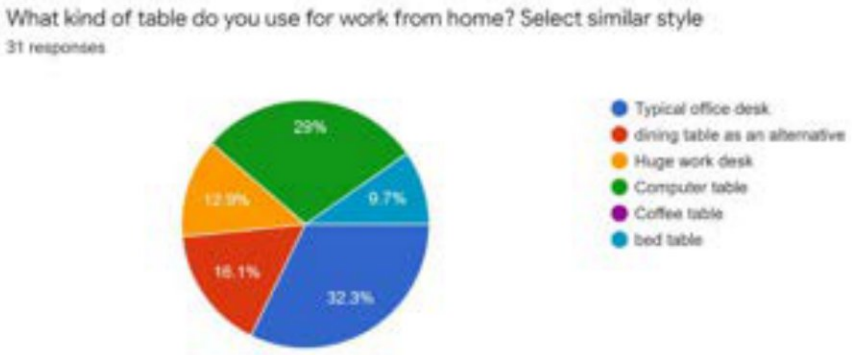
Prepared a google form questionnaire to understand user requirement and challenged faced by them in work from home scenario.

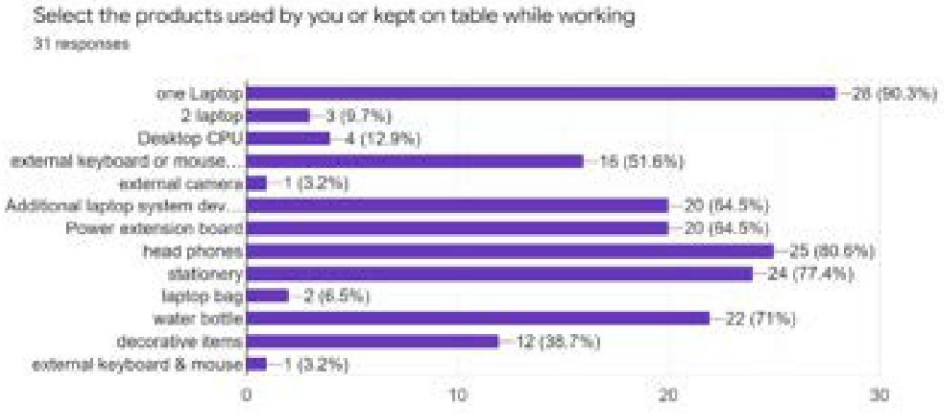
Here is the link to the form circulated with people working from home. Some of them are working in IT industry and some are college students attending online classes from home. Since both of them require a good table to work on for long hours, the form was circulated with both the user group.

https://docs.google.com/forms/d/e/1FAIpQLScgm_y1u1tMXExbZAFHZt_cu377HcI90qw0NoeMvcmUXxrMUw/viewform?usp=sf_link

I have received 31 responses from different user group as shown below.

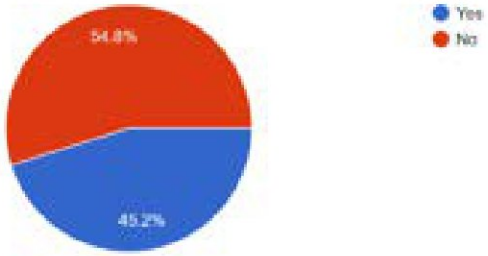




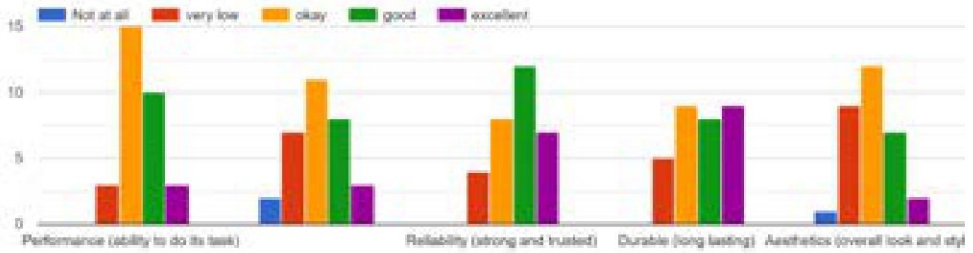


Is the size of current table sufficient for your needs?

31 responses

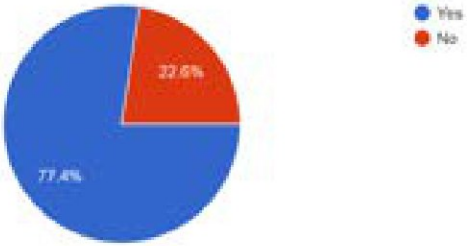


How would you rate your existing table for the following factors?



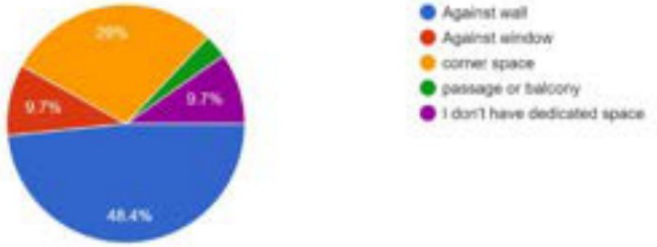
Do you have sufficient space to keep work table in the house?

31 responses



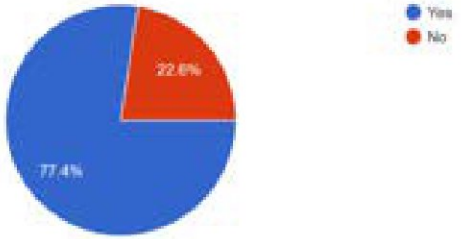
Please select the kind of space you use to keep table at home?

31 responses



Are you happy with the positioning of the table?

31 responses

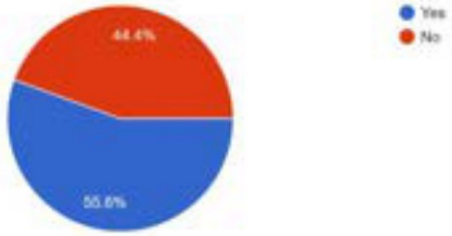


Choose your work life. Do you eat food (breakfast or lunch or dinner or coffee breaks) at work desk?

31 responses

If yes. Do you feel the need for a dedicated space for food and beverage on the table?

27 responses



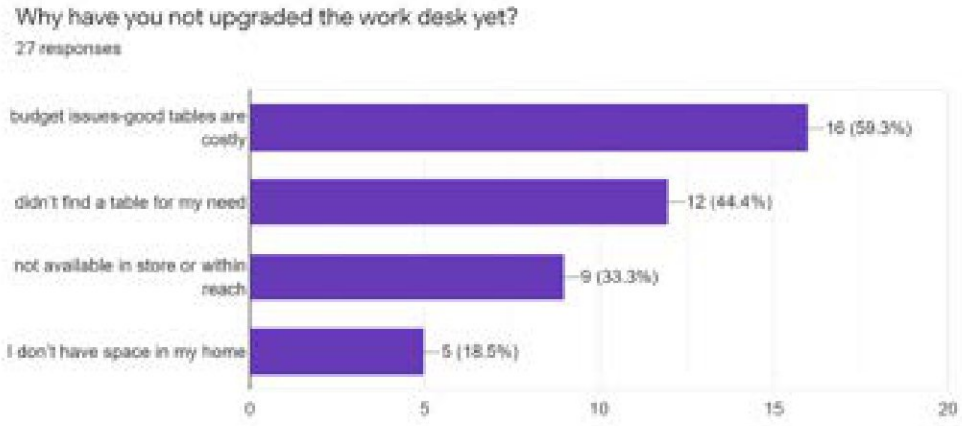
If NO, why? Please elaborate

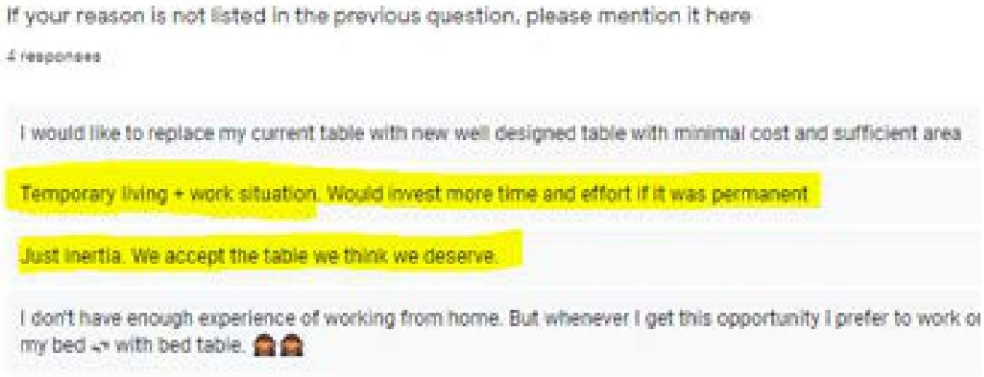
6 responses

I wish to have my table near window or atleast in a relatively open space, but it is in corner
I feel so enclosed and feel very tightly packed up against the window. For me, I like large space on table so that I can spread my stuff and feel spacious. Even if the table is placed against a wall, I would like it to have more space where the user faces. Otherwise it feels like a closely packed up space.
My table position is near the shelf so that I can keep my books and other study material, because of this I have to adjust according to it.
Inside dining space. Lots of circulation esp during morning when maid is there.
No table height adjustment and not enough space for external monitor and keyboard draw positioning and space are enough
I don't feel happy while working as the lighing is not proper in the corner against the wall.

Would you like to upgrade your work desk?

31 responses





Insights gained from user survey

Major issue analysed from the survey is that people are ready to upgrade their desk but the one with full feature is out of their budget.

Many considered that work from home is a temporary situation and that is why they did not want to spend a lot on such furniture.

5.2.3. USER INTERVIEW

User 1

Name: Mr. Subhash Muthukumar

Gender: Male

Occupation: Project Manager

Location: Mysore

User 2

Name: Ms. Dipika Rajput

Gender: Female

Occupation: IT professional

Location: Lucknow

User 3, 4, 5

Occupation: Design student

Here is a fixed table with a long table top to keep all the stationery and devices related to study.

Since a designer in general need a lot of tools and devices as compared to a professional working from home, there is requirement of more storage space and better organisation of products for a clutter free space.

Some of the problems identified with their desk were,

- Too many devices and tools on table top
- Cluttered space
- Movement restriction, body aches in longer sitting
- Additional power unit for multiple devices
- Fixed table hence restricted orientation of table
- No dedicated space or storage for products
- No wire management

5.2.4. INSIGHTS GAINED

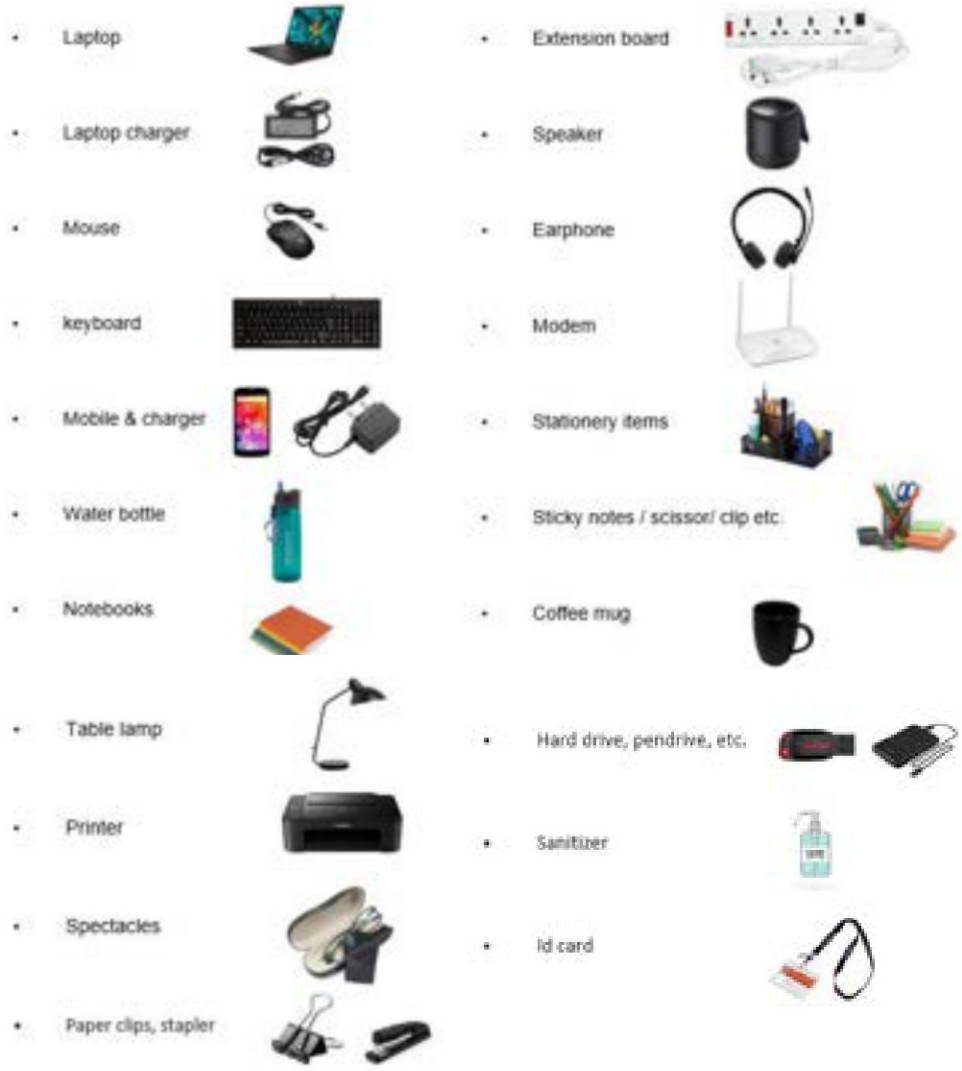
Key insights gained from **user 1** over video call:

1. Current table is not adjustable for height
2. Wrist and arm pain due to no support
3. Cannot just keep it anywhere due to power restriction
4. Need additional power extension to connect multiple devices
5. Fear of food/ beverage spillage on table
6. Not able to maintain organised desk
7. Tired of long sitting
8. Uses both hands for different task so there is need for good hand movement

Key insights gained from **user 2** over video call:

1. Current table is not adjustable for short height
2. Wrist and arm pain due to no support
3. Need additional power extension to connect multiple devices
4. Fear of food/ beverage spillage on table
5. Unorganised wire and desk
6. No visual comfort since room is closed while working
7. Need some greenery around
8. Tired of long sitting

Related products Identified



5.2.5. PROBLEM IDENTIFICATION

1. Context

   Due to pandemic, there has been a shift in work from home culture for IT professional and this has impacted them in multiple ways. People have adapted to different style of working at home. While some use a proper office desk many use a very basic table or a bed table or dining table or sit on floor. This has led to issues like body aches, mental stress, long sitting, body movement restriction




2. Design problems

   a. **Ergonomics** – human factors, comfort, body aches, movement restrictions


   b. **Usability** – space management, accessibility of products behind the laptop is difficult


   c. **Industrial design** – furniture standardization, manufacturing consideration, transportations, services, maintenance, safety

6. DESIGN

6.1. INITIAL DESIGN BRIEF

To design a smart work station for “work from home” scenario for people working from home (IT industry) for better product accessibility, organization, sitting and standing work posture accommodation.

Need of the project

To make smart and more user-friendly table to accommodate their work from home lifestyle

Motivation

I myself having worked as IT engineer can empathize with the challenges faced as an IT professional and also studying online for first year of m.des has given me the experience and motivation to think of different ways of improvement in the existing work desk available in market

Target market

Furniture manufacturer

Target user

- **Primary user** – People working from home
- **Secondary user** - everyone else who require desktop to work or study from home

IT professionals

Students

Others

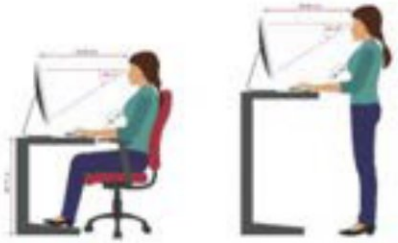
6.2. SCOPE OF PROJECT

Compact yet enough storage space

organizers to fulfil user needs – clutter free space

some aesthetic to make them feel close to nature

Better ergonomics



height adjustment

Task planning solution

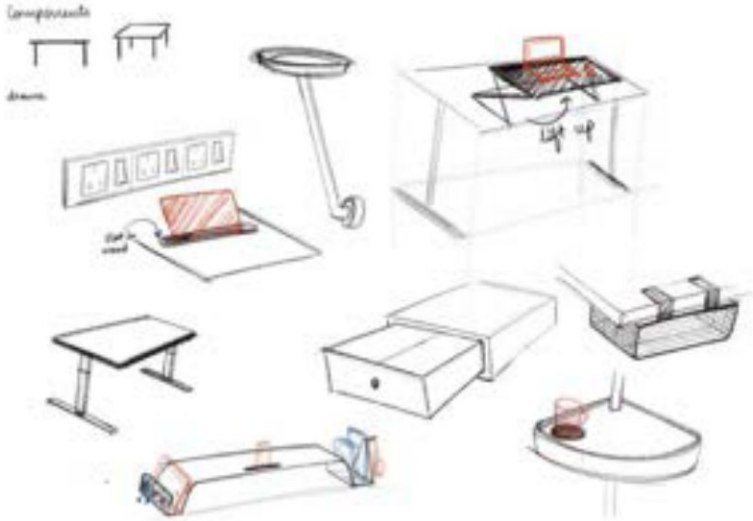
Power nap solutions

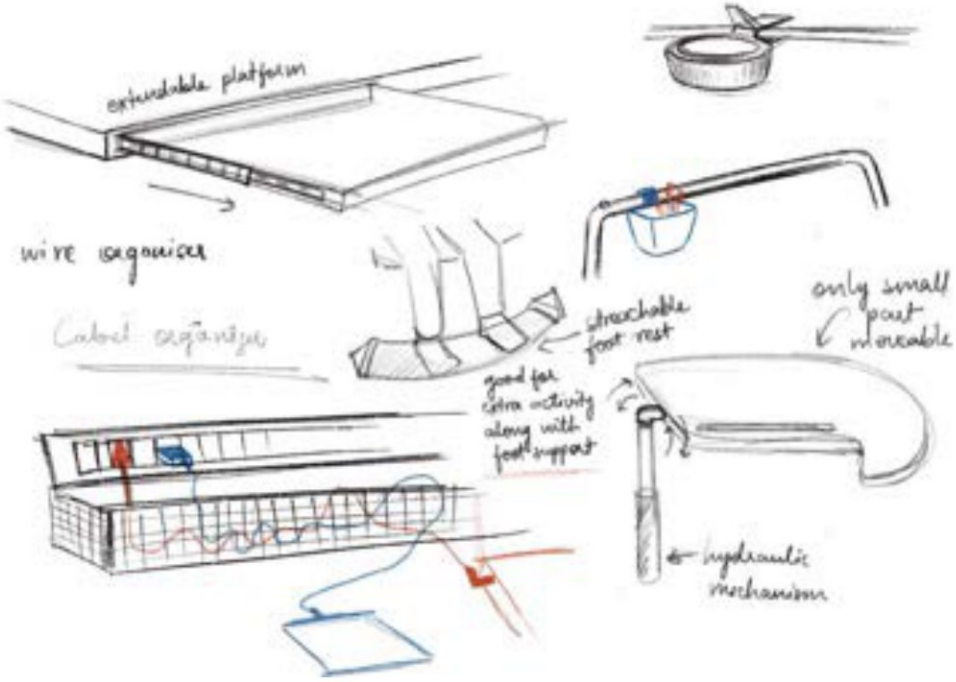
Food storage solution

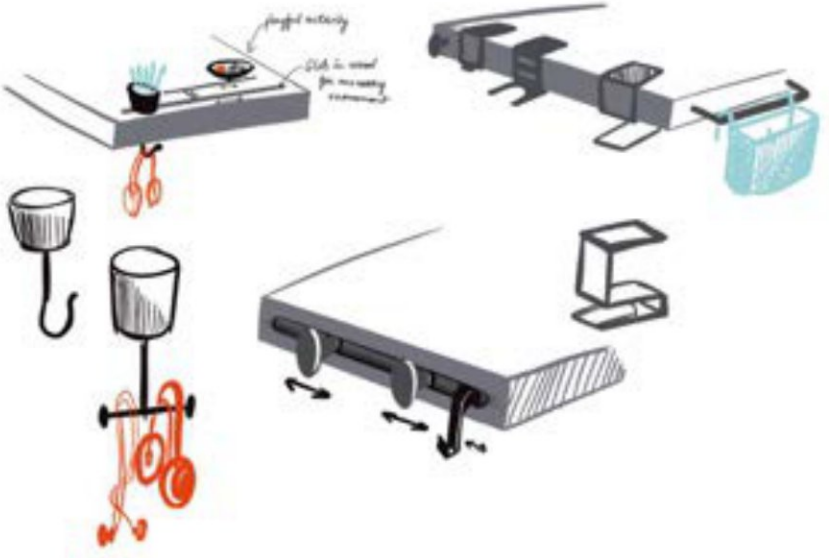
Water bottle storage solution

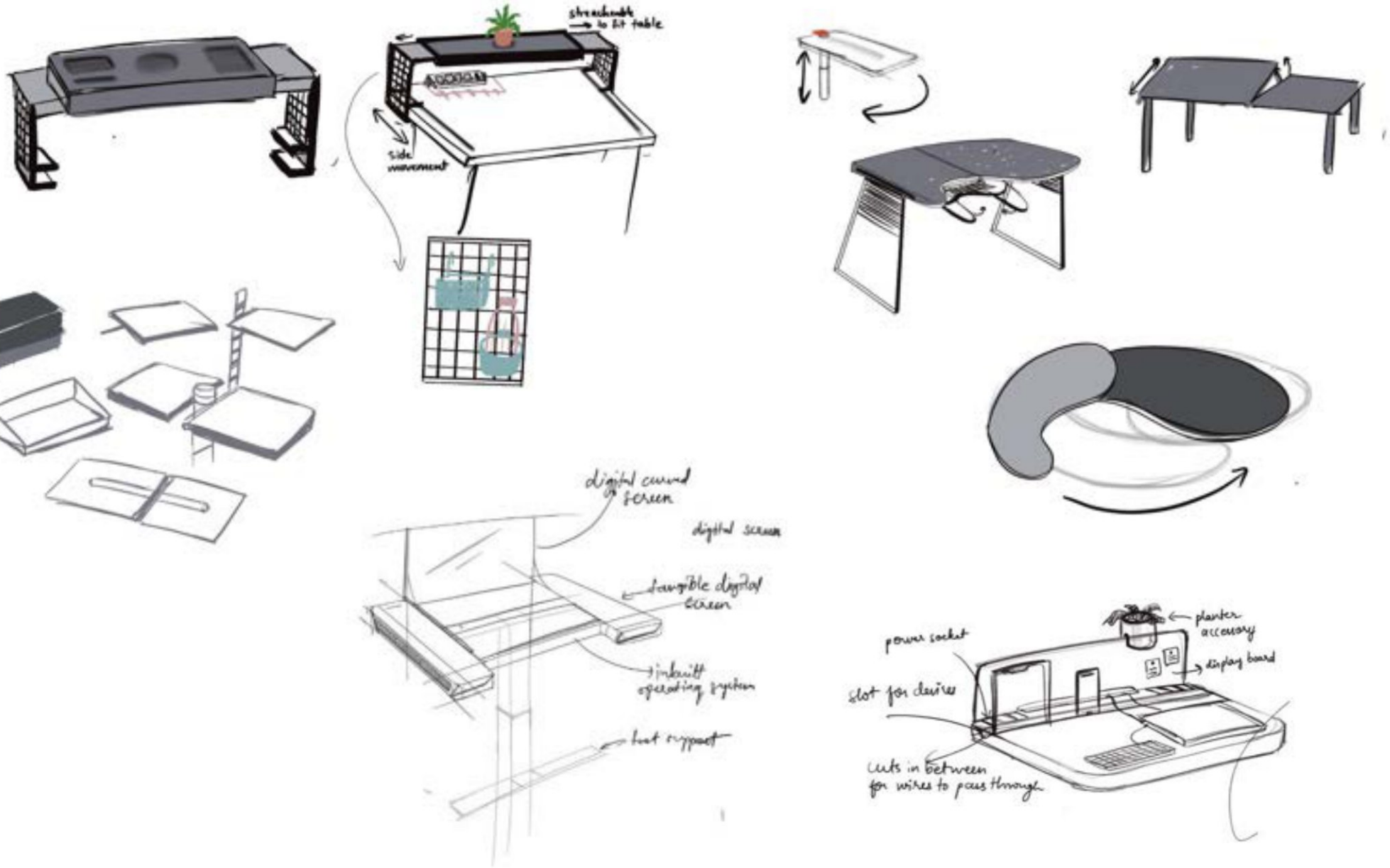
6.3. DESIGN IDEATIONS

Product features – slider, drawers, wire managers, organisers etc

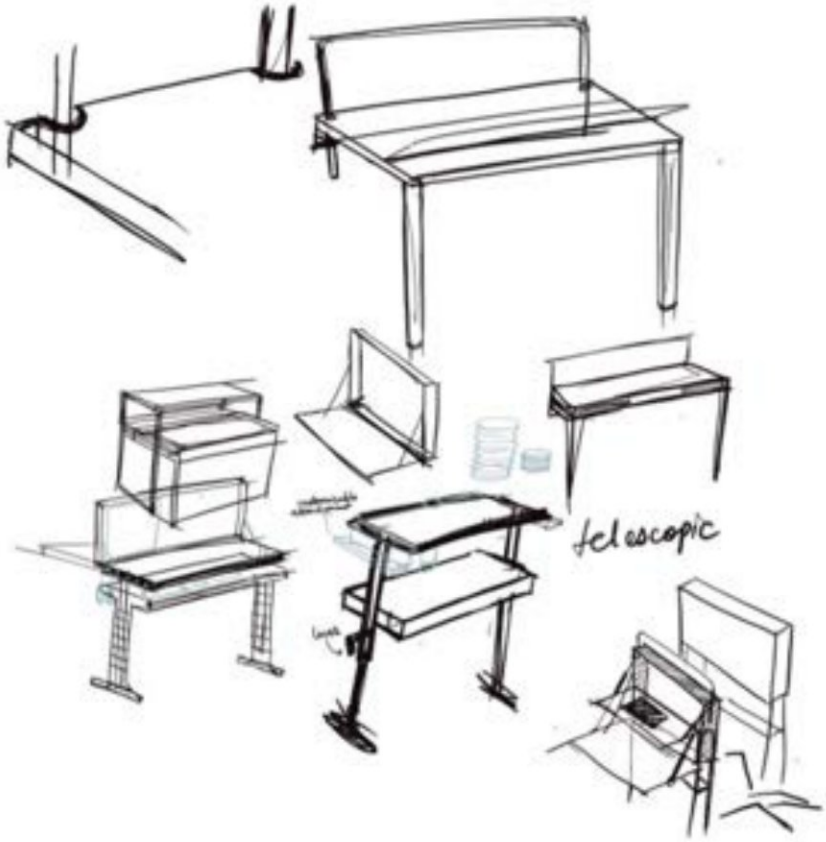


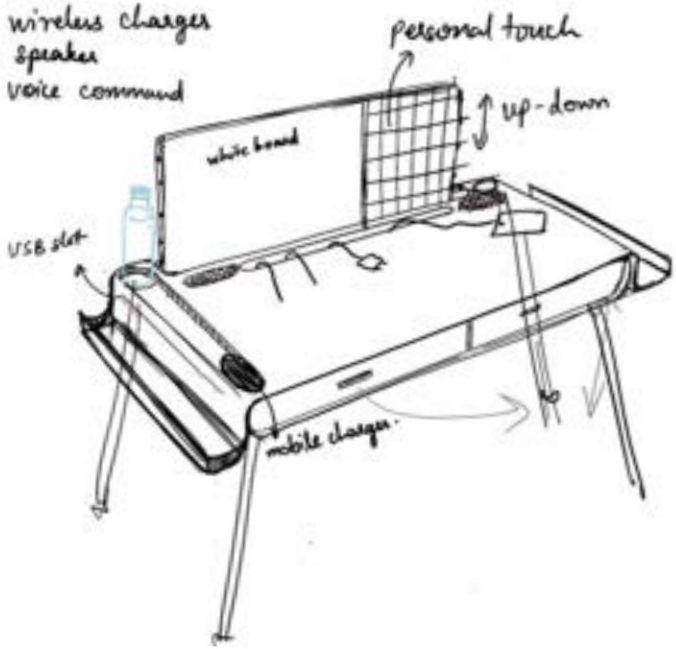


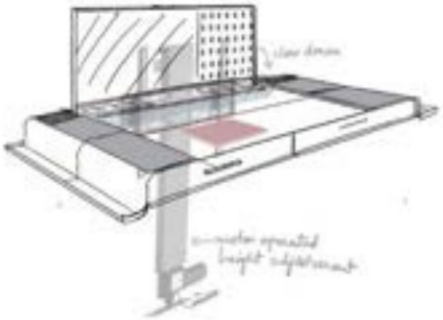



stretchable to fit table
side movement
digital curved screen
digital screen
tangible digital screen
inbuilt operating system
foot support
planter accessory
power socket
display board
slot for devices
cuts in between for wires to pass through

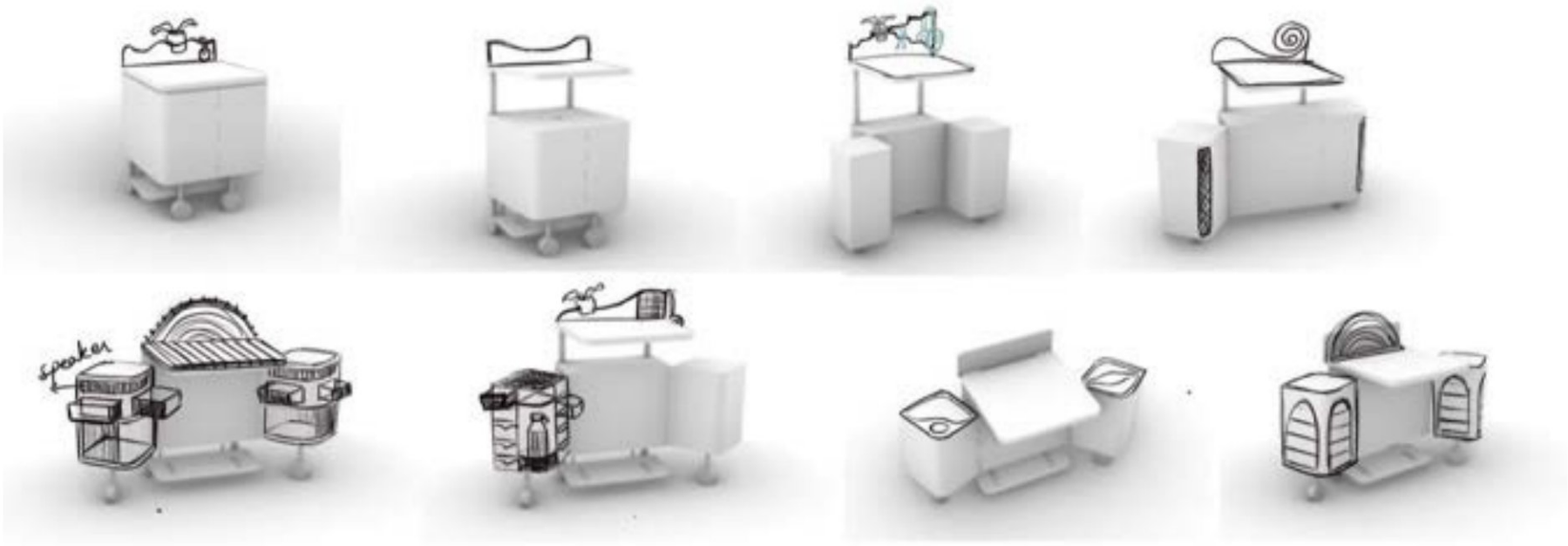

wire basket
underneath
CPU
up
down
?

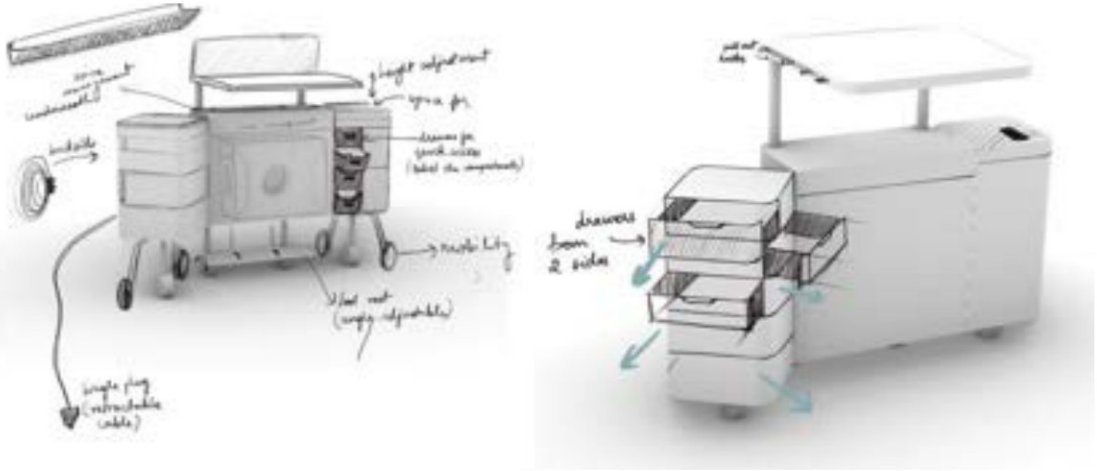

telescopic


wireless charger
speaker
voice command
personal touch
up-down
white board
USB slot
mobile charger



Block model ideations





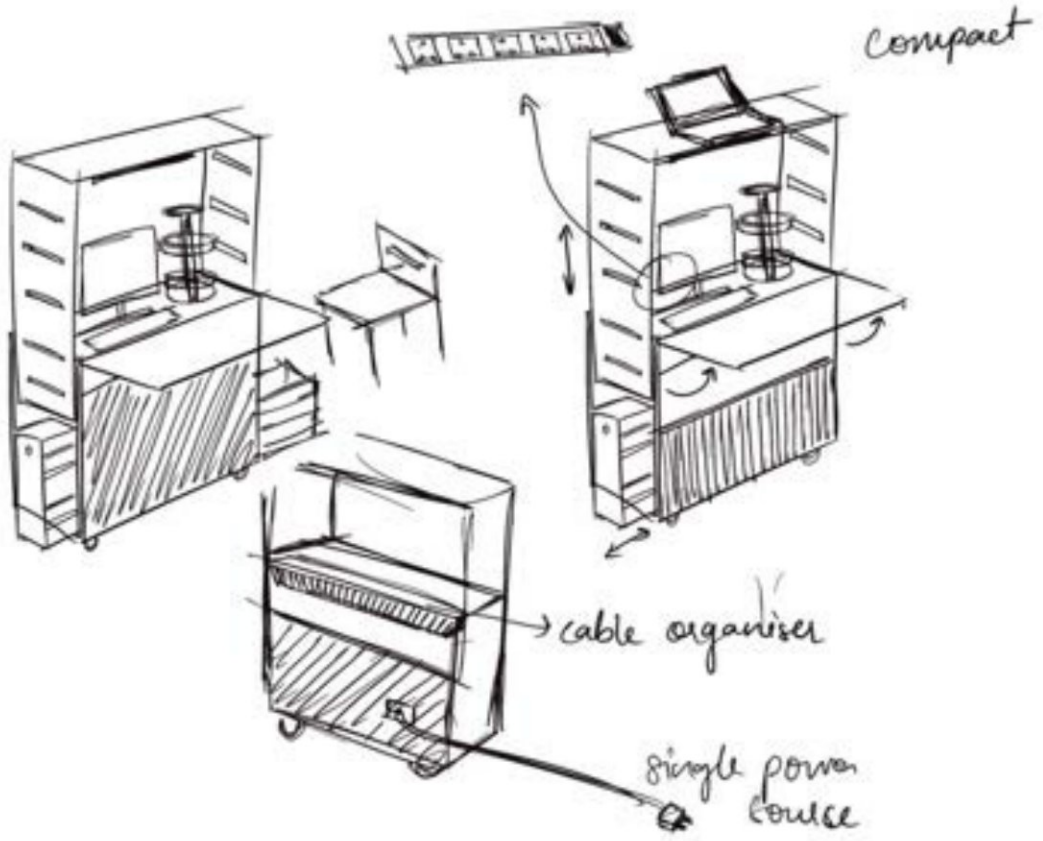
6.4. CONCEPT GENERATION

6.4.1. CONCEPT 1

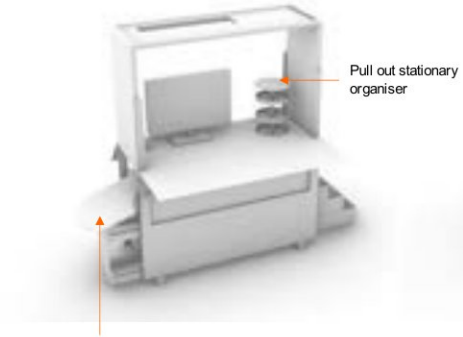
Compact and self-sufficient mobile work desk

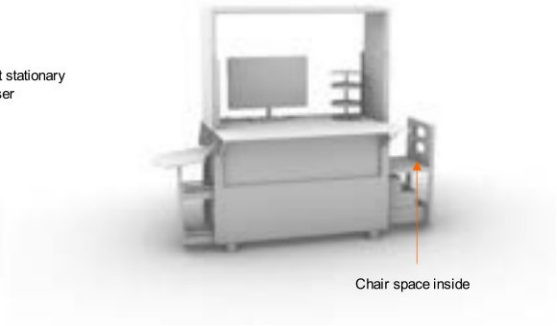
Key features:

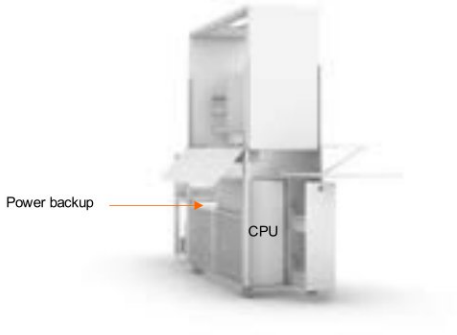
- Portable
- Space saving
- Height adjustment
- Battery backup

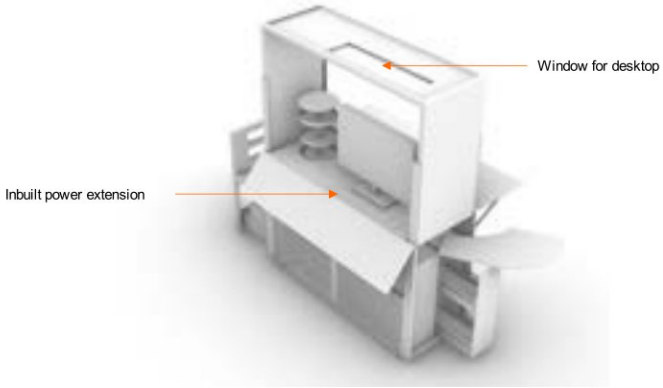


The first concept is to make the table compact, self-sufficient, portable and yet not compromise on the key functionality of work desk. It will be a wholesome smart table to fulfil user requirement.


Pull out stationary organiser
Tray for food and beverage


Chair space inside


Power backup
CPU

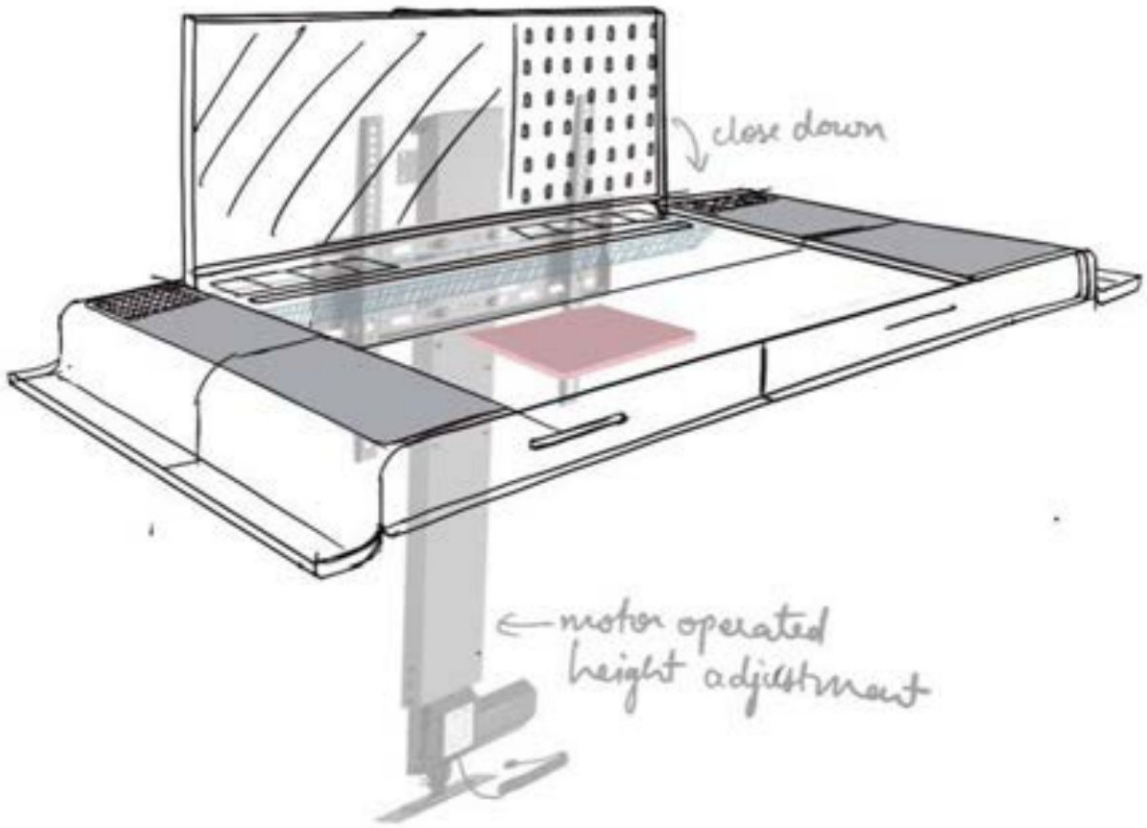

Window for desktop
Inbuilt power extension

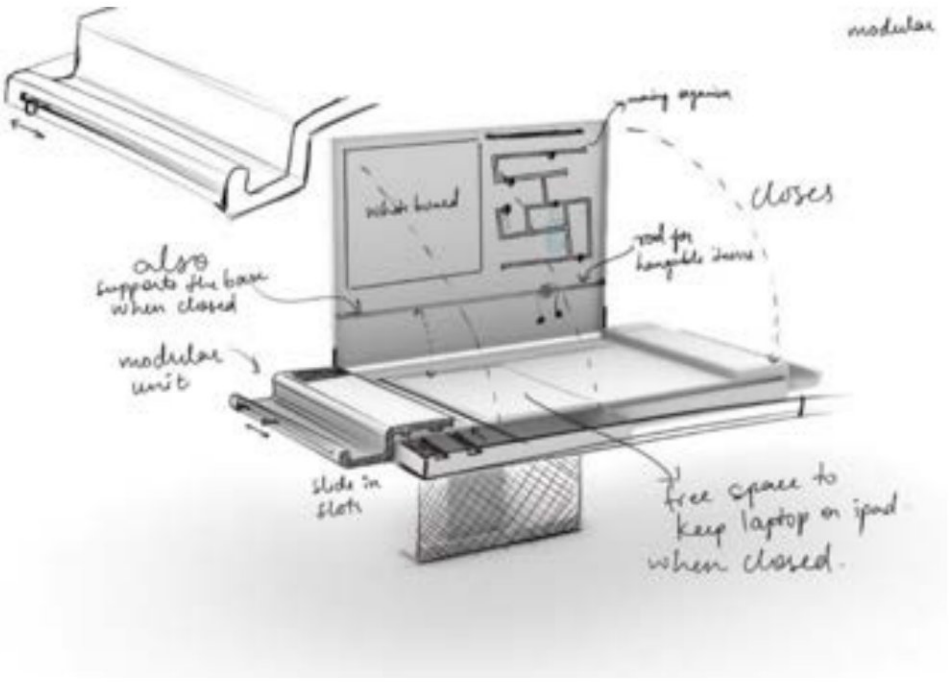
6.4.2. CONCEPT 2

Minimal Wall mount height adjustable smart work desk

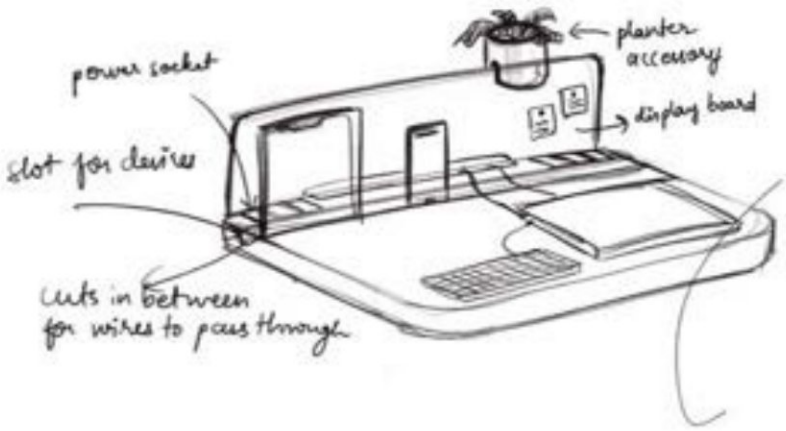
Key features:

- Wall mount Height adjustment
- Wireless charging
- Smart voice command activation
- Inbuilt speaker
- Minimal aesthetics





https://www.amazon.in/Vertical-Motorized-Controller-Adjustable-Bracket/dp/B08MLNHDTZ/ref=asc_df_B08MLNHDTZ/?tag=googleshopdes-21&linkCode=df0&hvadid=397005783307&hvpos=&hvnetw=g&hvrand=3325529013765878479&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9062235&hvtargid=pla-1107463725343&psc=1&ext_vrnc=hi



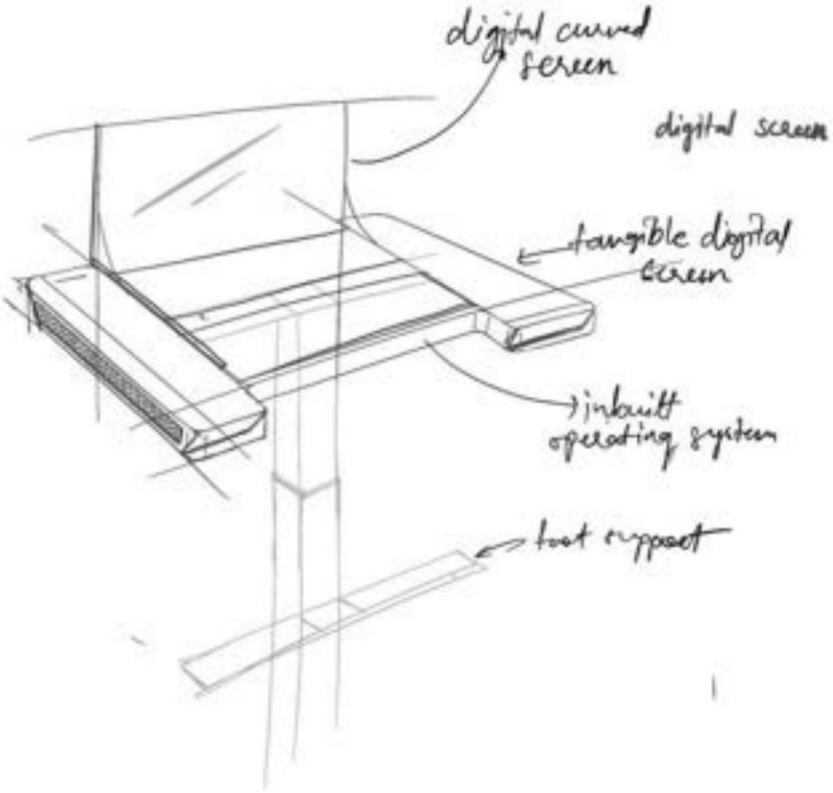
t

6.4.3. CONCEPT 3

Futuristic smart work desk to eliminate multiple devices

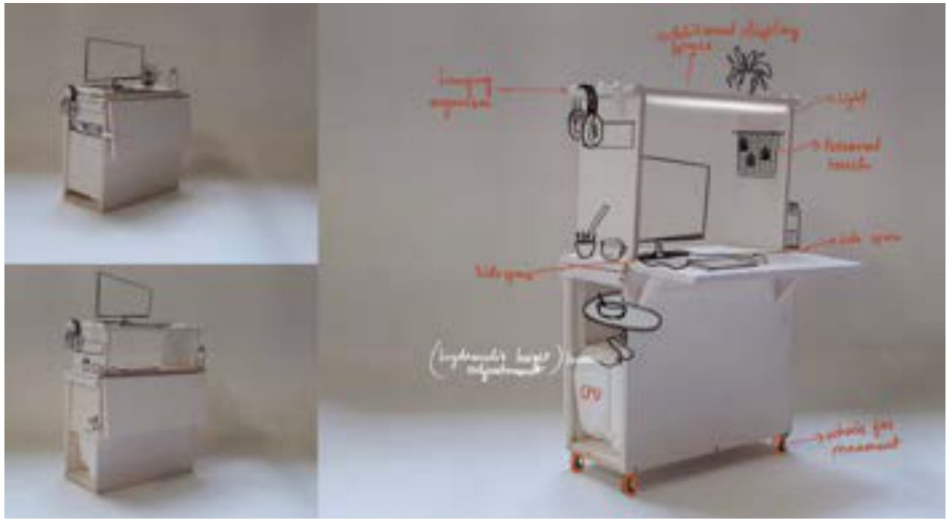
Key features:

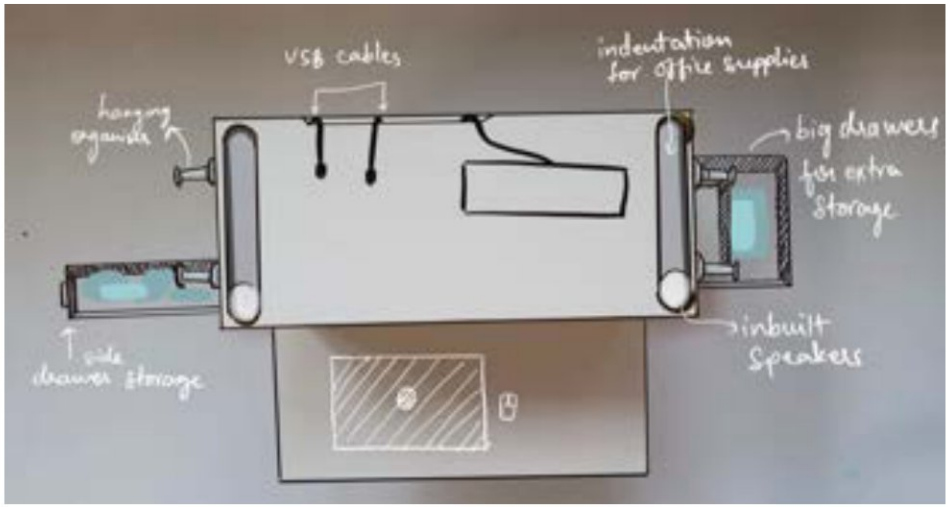
- Inbuilt screen table top
- Tangible product detections and interaction
- Smart voice command activation
- Inbuilt speaker
- Can be Wall mount or movable



6.4.4. MOCK UP

Concept 1 mock-up





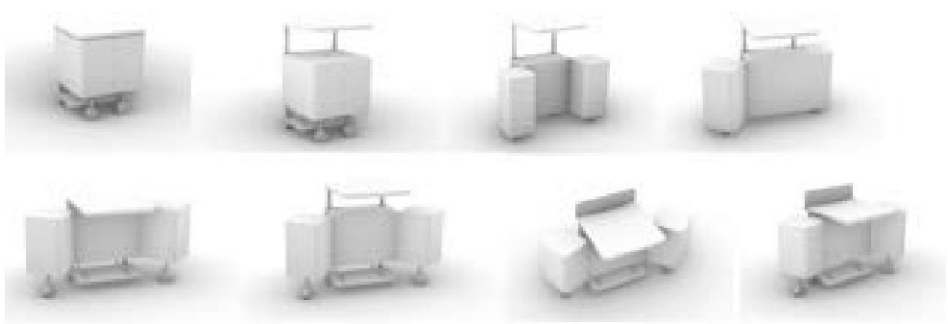
Concept 2 mock-up

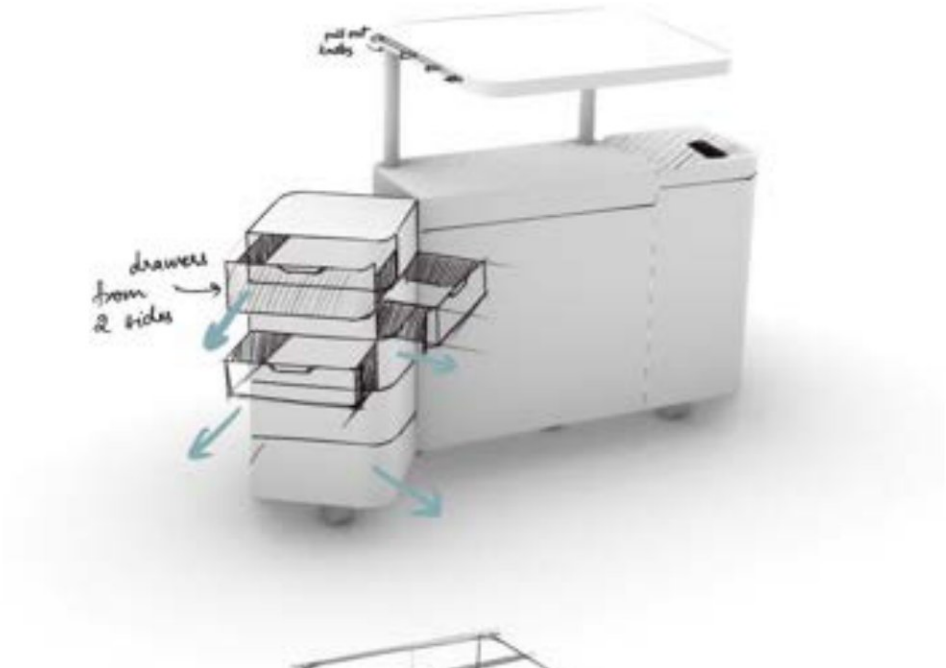
6.5. CONCEPT DEVELOPMENT

Concept development for the concept 1 with the help of block model and sketches

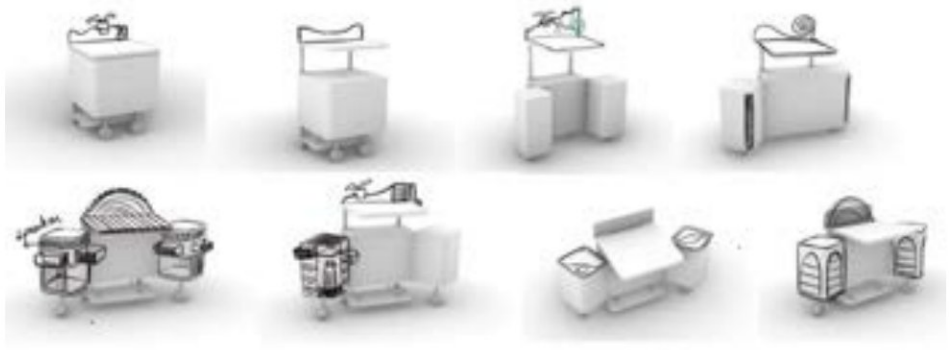
6.5.1. 3D BLOCK MODEL

Basic block model

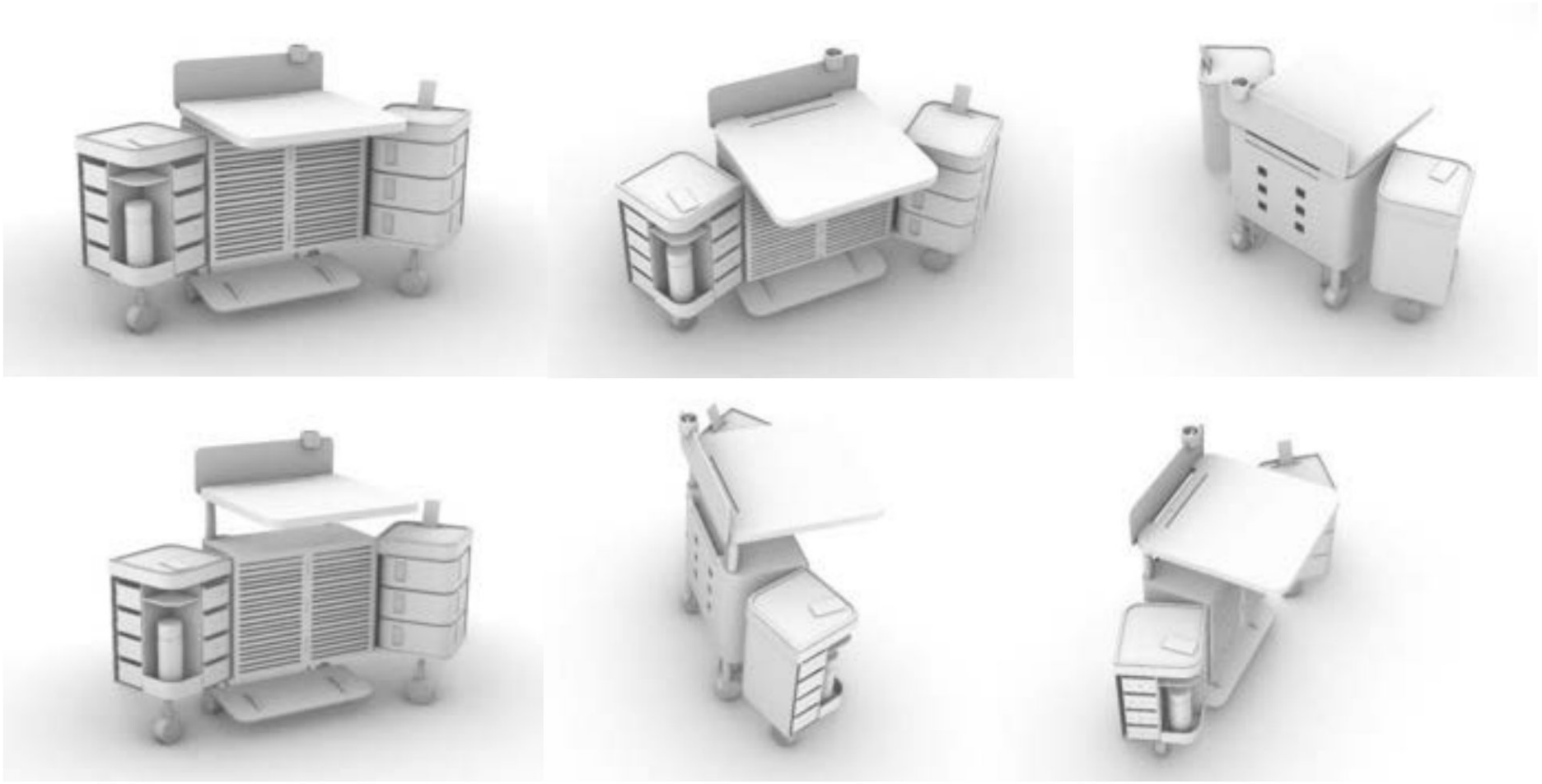


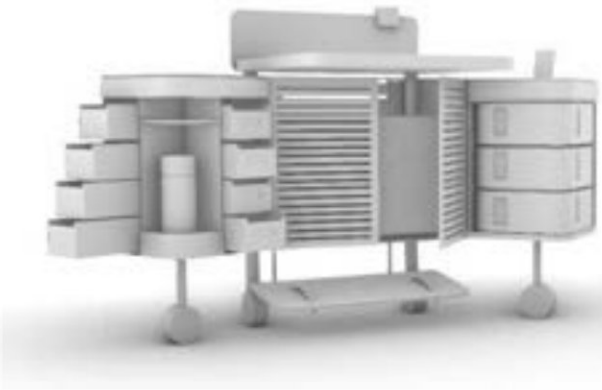


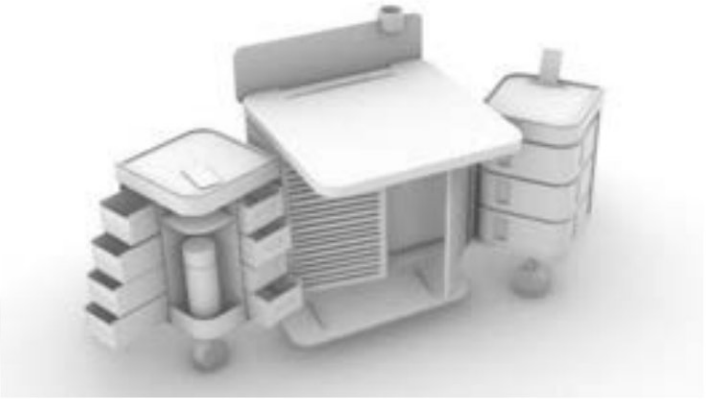
Doodles over basic model for visualization

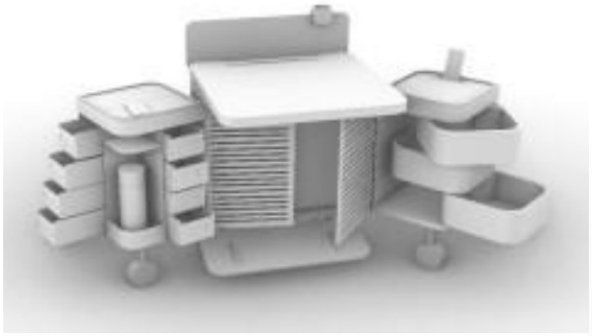


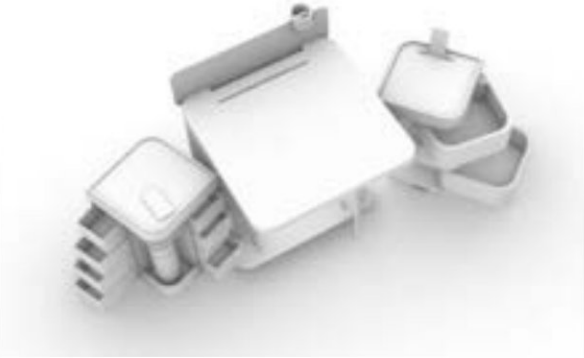
6.5.2. FUNCTIONAL DETAILS THROUGH BLOCK MODEL











6.6. CONCEPT EVALUATION

6.6.1. CRITICAL ANALYSIS

Evaluate each design concept against garvin's 8 dimensions of quality and rate it on the scale of 1 to 10

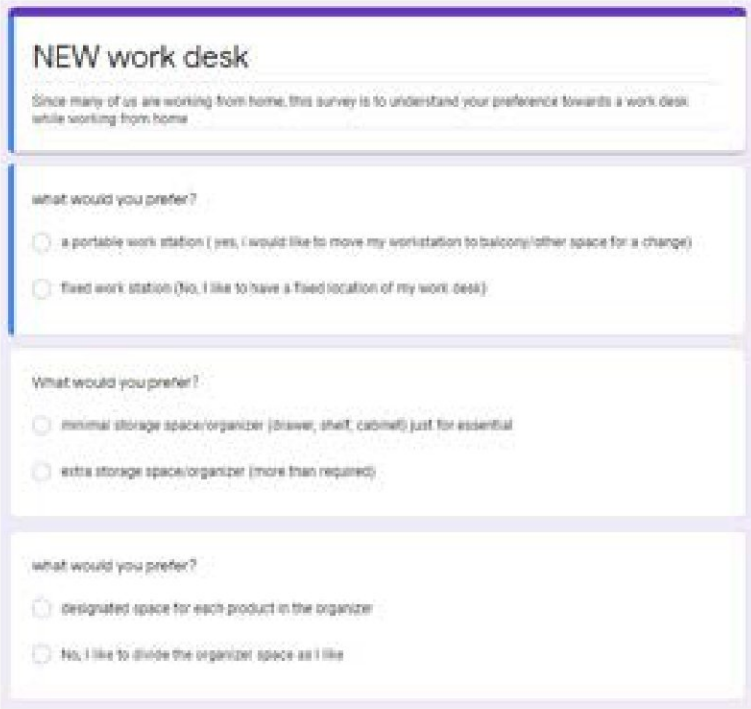
Based on the priority

1. **Reliability** – can I blindly believe it
2. **Durability** – will it stay with me for long time (will it go without diminishing with time)
3. **Features** – fundamental functions and additional functions above that (add-on)
4. **Conformance** – follows industrial standards (materials it can use, dimensions, ergonomics)
5. **Serviceability –** is it easily fixable, how easily can it be maintained
6. **Aesthetics –** aesthetics that strikes your eyes – visual quality
7. **Perceived Quality -** defined by form, how one feel when they look at it, it sometimes is also derived from brand ex; tesla
8. **Performance –** overall usability, reliability

User Evaluation

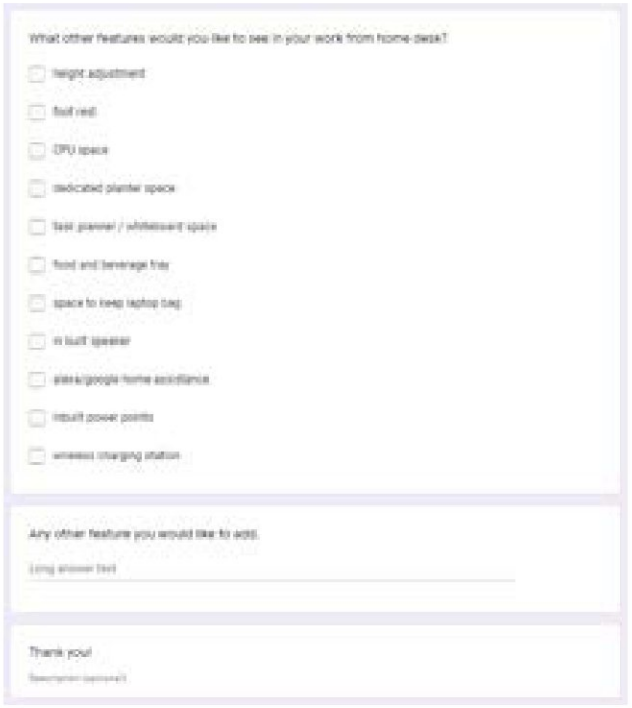
To understand the preference of various features, I created a google form with questions to understand what user actually desires to see in their work desk and based on that I can prioritize the functional and aesthetic features of the work desk. Below is the form for the same.

There were total of 35 responses.



https://docs.google.com/spreadsheets/d/1tvjY6zspon7q2PoExYQZnjKTybOTU7l8mOD7XhyqHvw/edit?resourcekey#gid=1778659048

*Response sheet



I got a good response from different users and this makes easier to analyse what a customer is looking for.

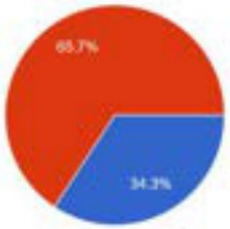
what would you prefer?

35 responses

- a portable work station (yes, I would like to move my workstation to balcony/other space for a change)
- fixed work station (No, I like to have a fixed location of my work desk)

what would you prefer?

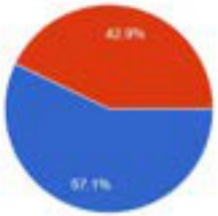
35 responses



- designated space for each product in the organizer
- No, I like to divide the organizer space as I like

What would you prefer?

35 responses



- minimal storage space/organizer (drawer, shelf, cabinet) just for essential
- extra storage space/organizer (more than required)

What would you prefer?

35 responses

Any other feature you would like to add.

14 responses

Wire tangling is big issue in desk. If possible make wire organiser for table. Headphone mount is essential which i felt. If possible, add some stress buster toys on desk. Extinction box you can add

Provision for cutting mat surface that doubles as a mousepad, calibrations on the table surface for measuring

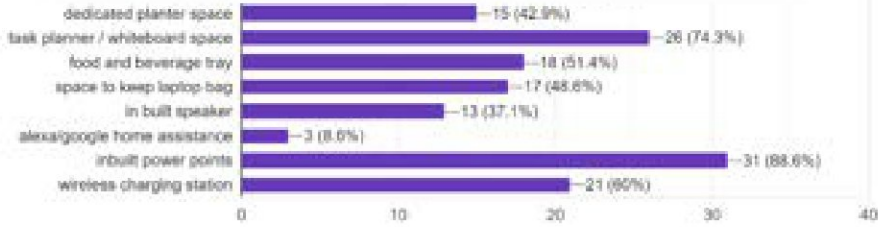
Small attached book shelf

Cable Management, VESA mount/ elevated unit for monitor. Adjustable angle drawing board support to keep ipad/wacom.

A Tilt Mechanism in the desk for a good angle to work, which will help maintain posture. Ample desk depth for versatile use.

Wire organization, slight slant angle adjustment of table top.

Would be great if it has any wire station where you can put the adapters of laptop in tray (station) which wouldn't occupy the space of the table



A place to keep papers and soft board.

Dustbin nearby

Footrest should be wood or plastic. Metal footrest in winter is painful

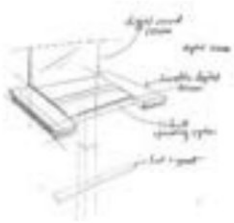
No

It would be nice to save space by maybe folding it somehow while not in use.

Integrated deskpad

cozy arm-rest (cushioned)

Based on user survey on their preferences, here is the ranking on various features from 1 to 10 where 1 being the lowest and 10 being the highest.



S.no	Functional comparison	Concept 1	Concept 2	Concept 3
	Storage space			
	Visible storage (open platform)	8	9	5
	Hidden storage (drawers, cabinets)	6	8	0
	Bottle space	8	8	5
	Laptop space	8	6	9
	CPU space	8	7	9
	Stationary organiser	8	6	3
	Height adjustment	8	8	8
	Task planning solution	7	7	7
	Food space	8	5	-
	Book storage space	8	3	-
	Laptop bag storage	-	-	-
	dustbin	10	-	-
	Clear arrangement			
	Wire management	8	6	8
	Safety			
	Safety while opening drawers	6	9	-
	Safety while moving furniture	6	7	8
	Ease of furniture assembly	-	-	8
	Easy to clean	7	8	8
	Power convenience	9	9	9

S.no	Ergonomics comparison	Concept 1	Concept 2	Concept 3
	Adjust to human dimension			
	Leg room	5	7	7
	Foot support	8	-	-
	Desk height	9	9	9
	Field of vision	8	8	-
	Arm support	5	5	-
	Offer convenience - comfort	7	8	-

S.no	Aesthetic feature comparison	Concept 1	Concept 2	Concept 3
	Adjust to interior			
	Fit to corner space	8	6	7
	Fit against window	7	3	6
	Fit against wall	8	8	8
	Fit to existing furniture at home	8	8	4
	Aesthetic appeal	8	9	7
	Follow trend	7	8	3
	emotions	-	-	-
	Reflects lifestyle	8	8	9
	Satisfy special user aesthetic need (plants)	9	8	3
	relocation	9	0	8

S.no	Overall comparison	Concept 1	Concept 2	Concept 3
1	**Reliability**	8	8	5
2	**Durability**	8	8	6
3	**Features**	9	6	8
4	**Conformance**	7	7	6
5	**Serviceability**	7	8	-
6	**Aesthetics**	7	9	7
7	**Perceived quality**	7	8	7
8	**Performance**	8	7	6

	TOTAL	**272**	**247**	**178**

6.6.2. CONCEPT FINALIZATION

6.7. FINAL DESIGN

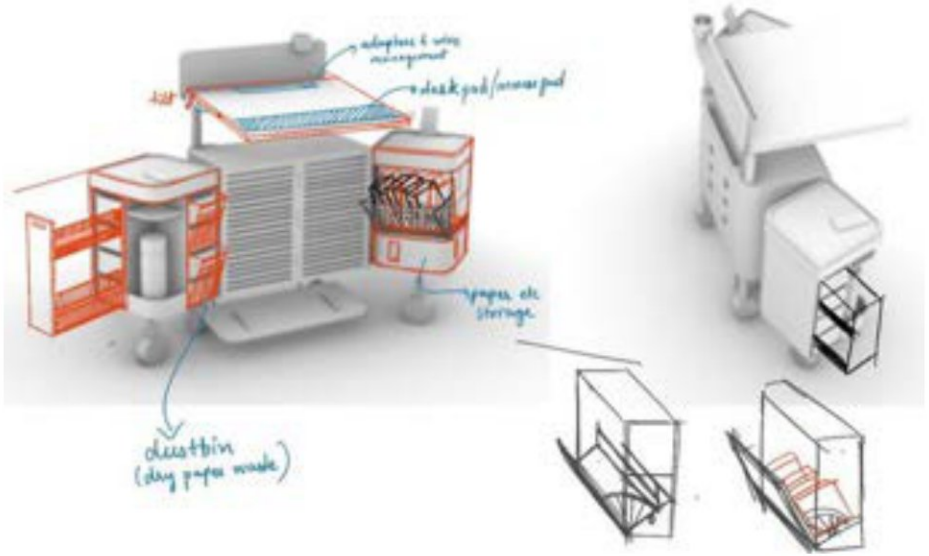
After critical analysis concept 1 which is the portable and compact work station is finalized to work further.

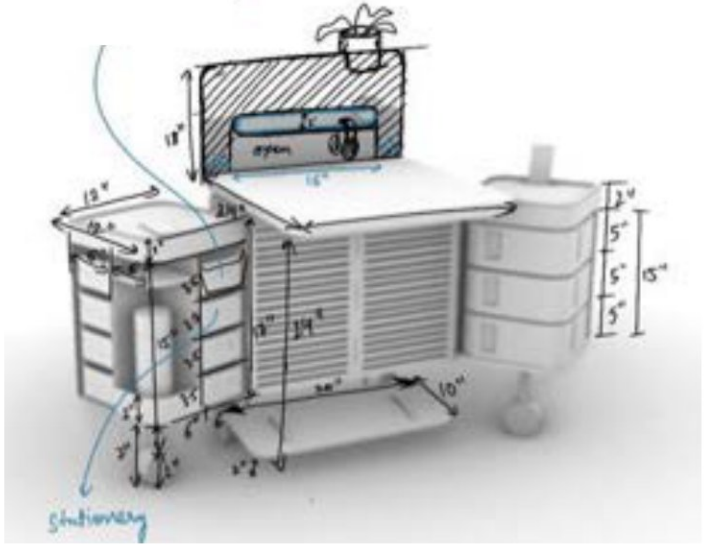
6.7.1. FINAL DESIGN BRIEF

To design a smart and mobile workstation for people working from home to accommodate following

- Sitting and standing work posture
- Compact and portable
- Better devices and stationery organisation
- Better wire management
- Better functionality and accessibility

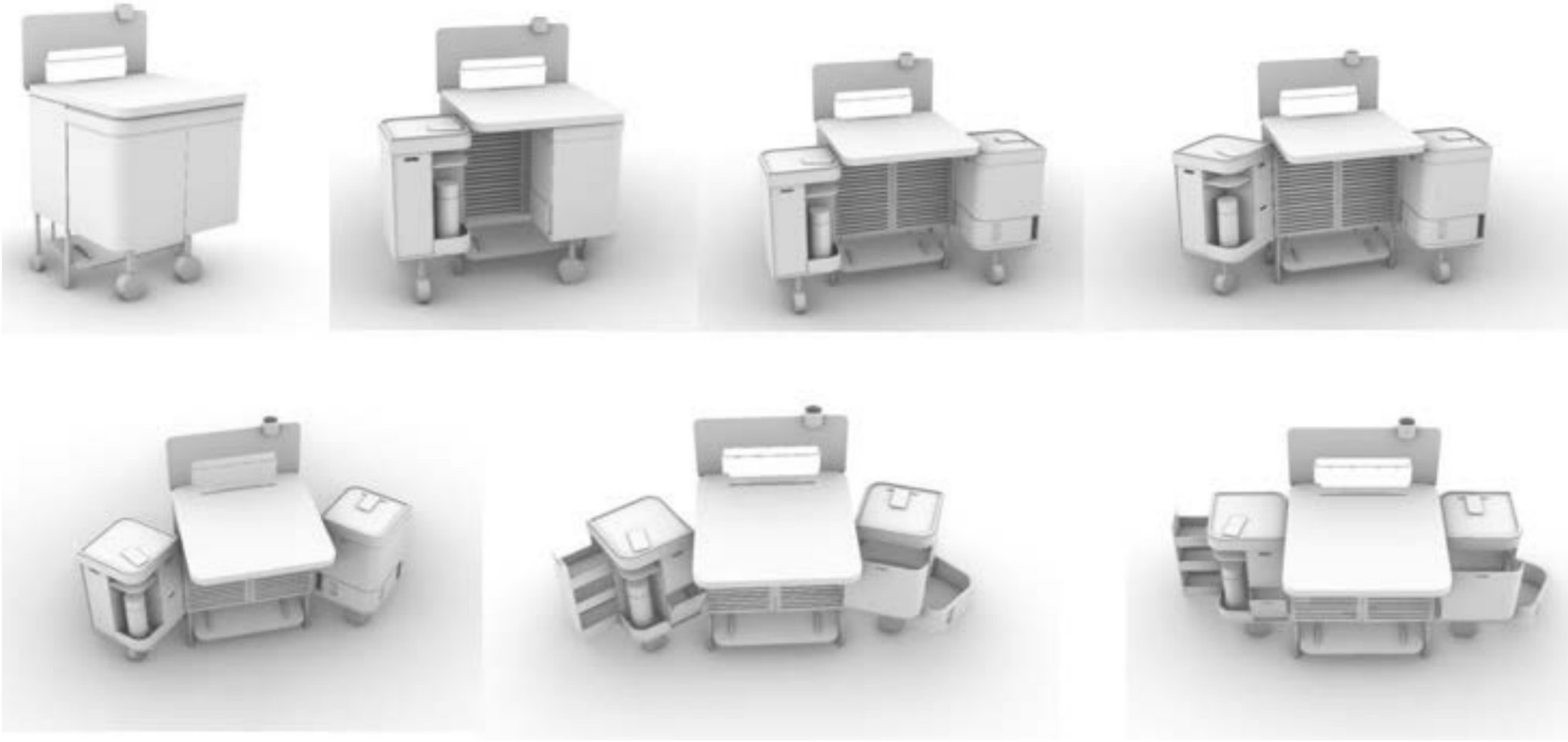
6.7.2. DESIGN SKETCHES

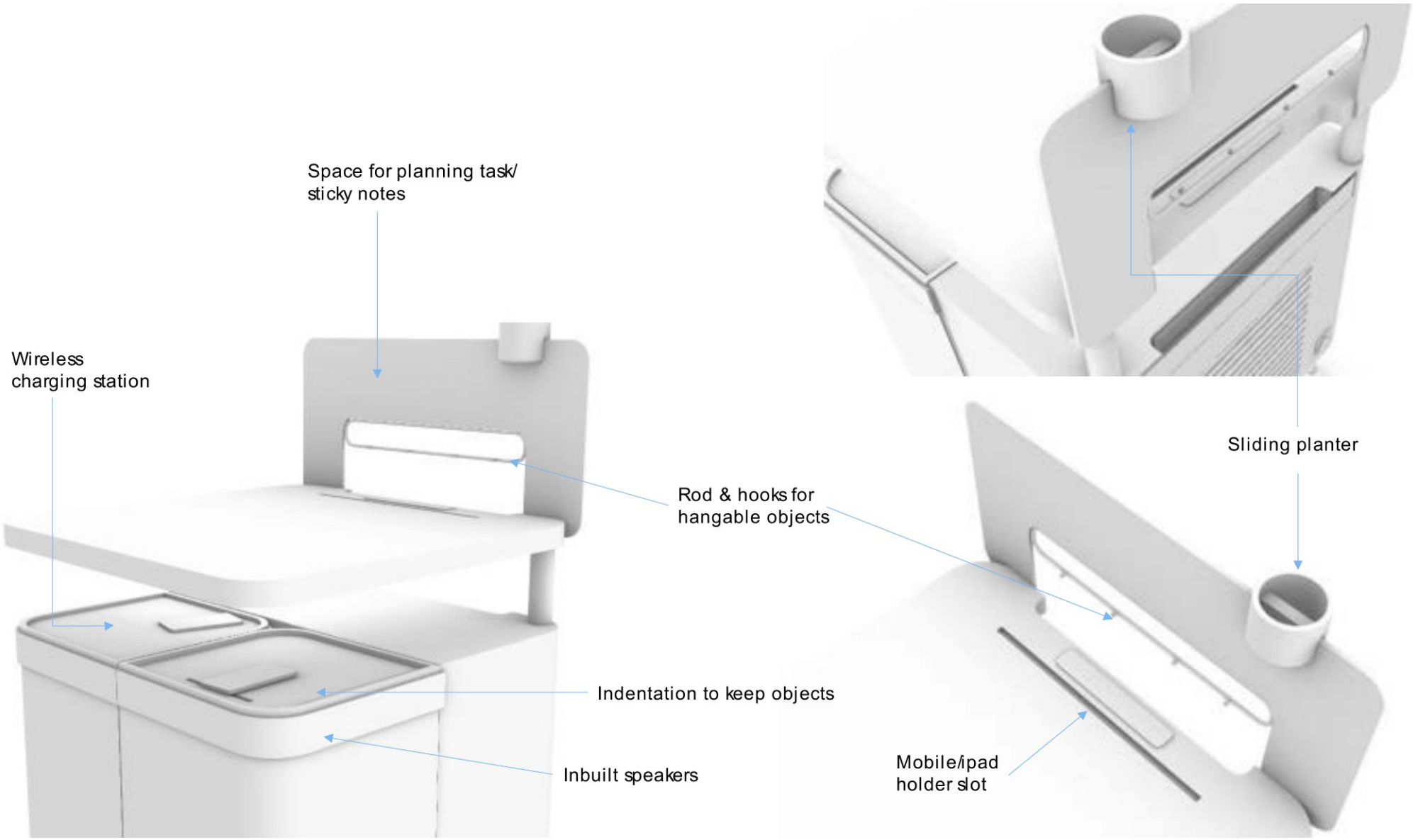


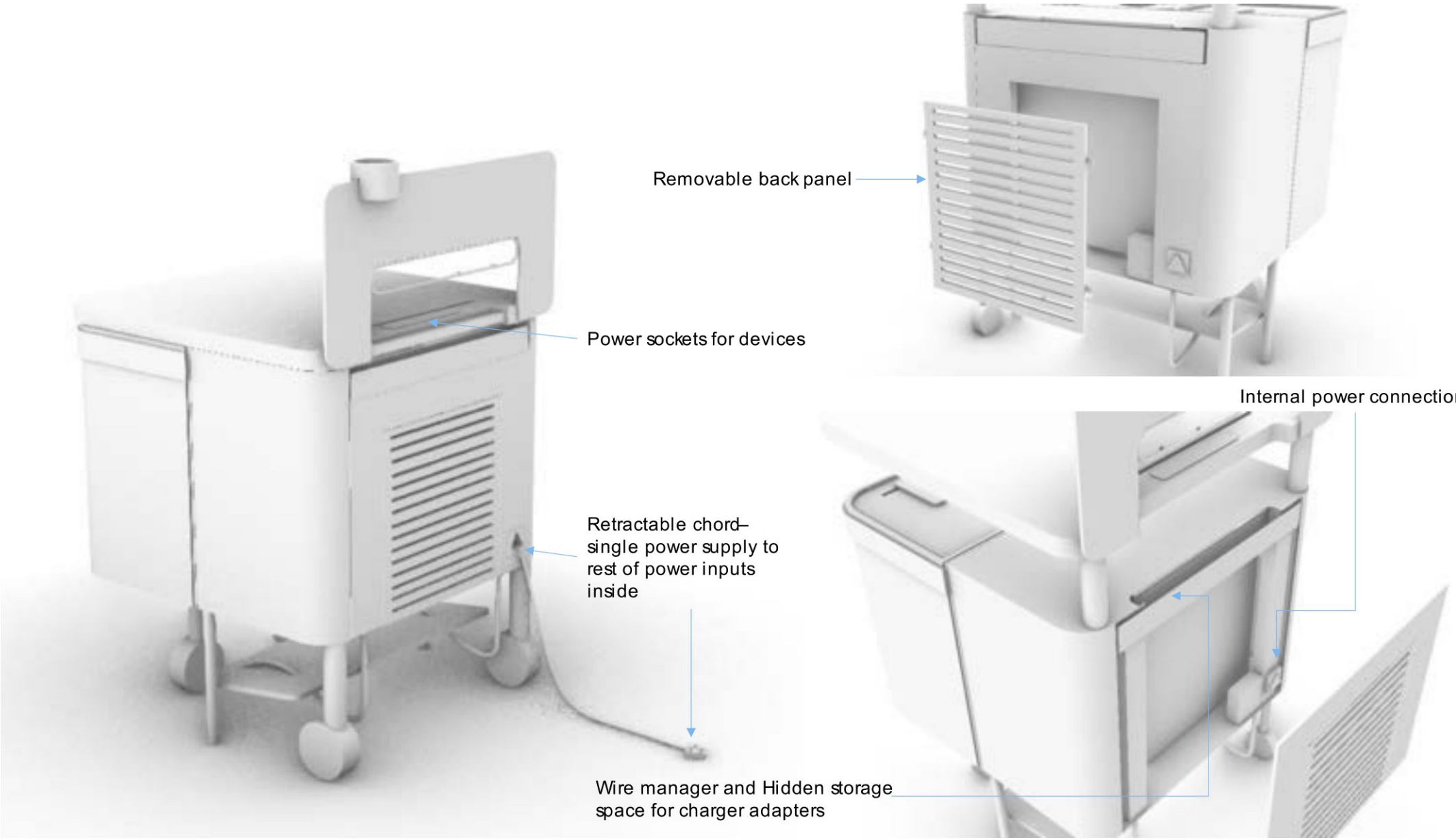


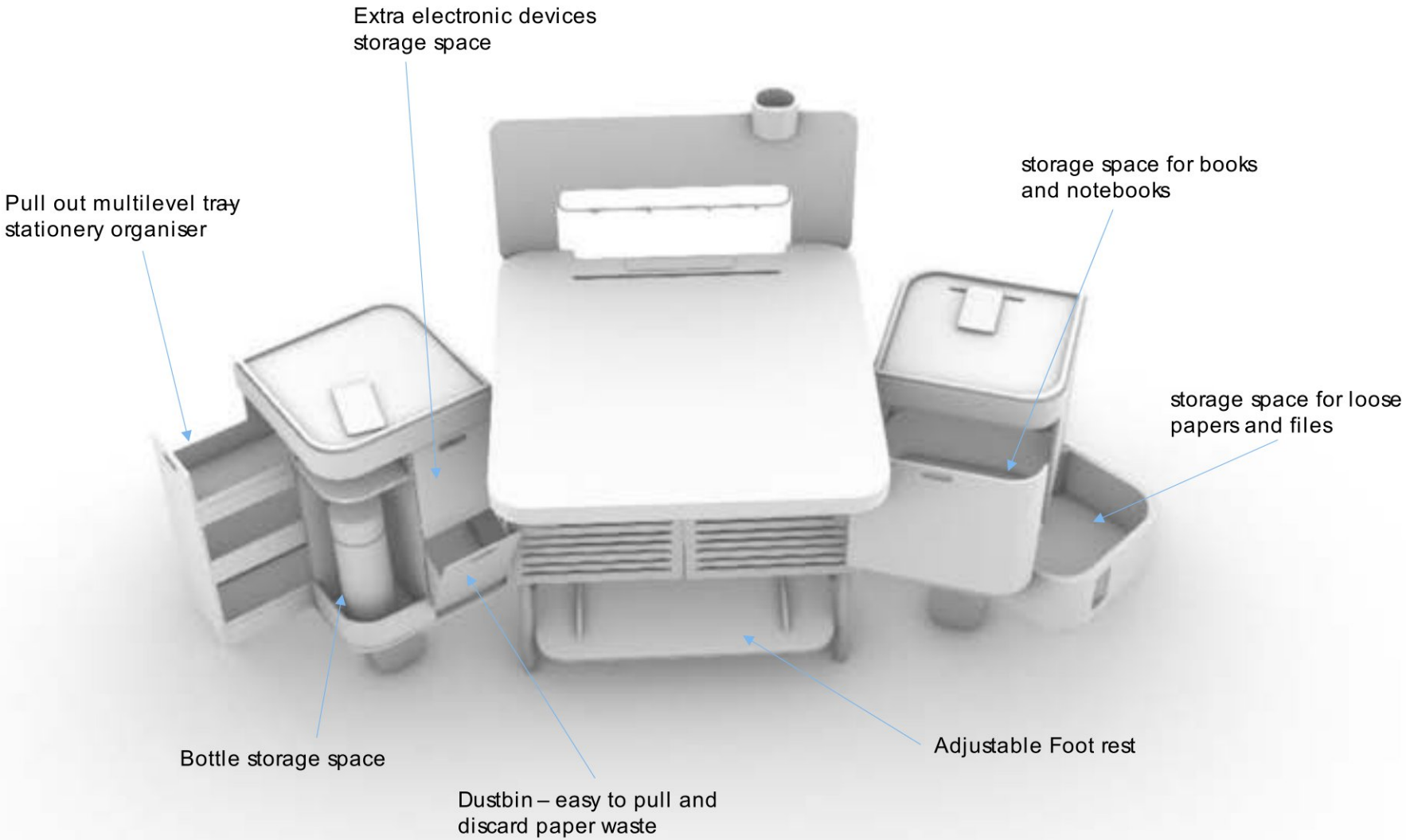
6.7.3. DESIGN DETAILS

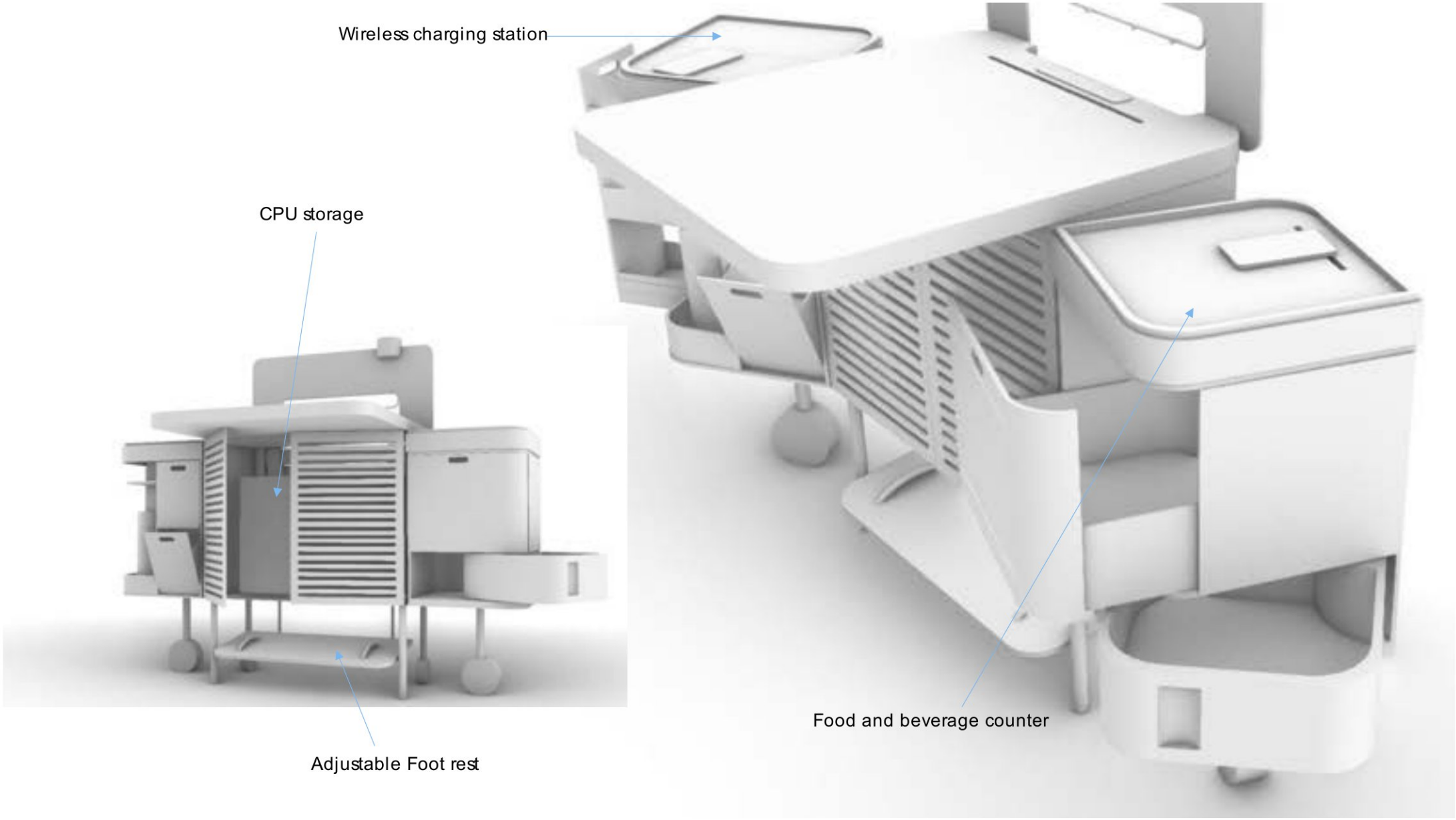
Detailed block model



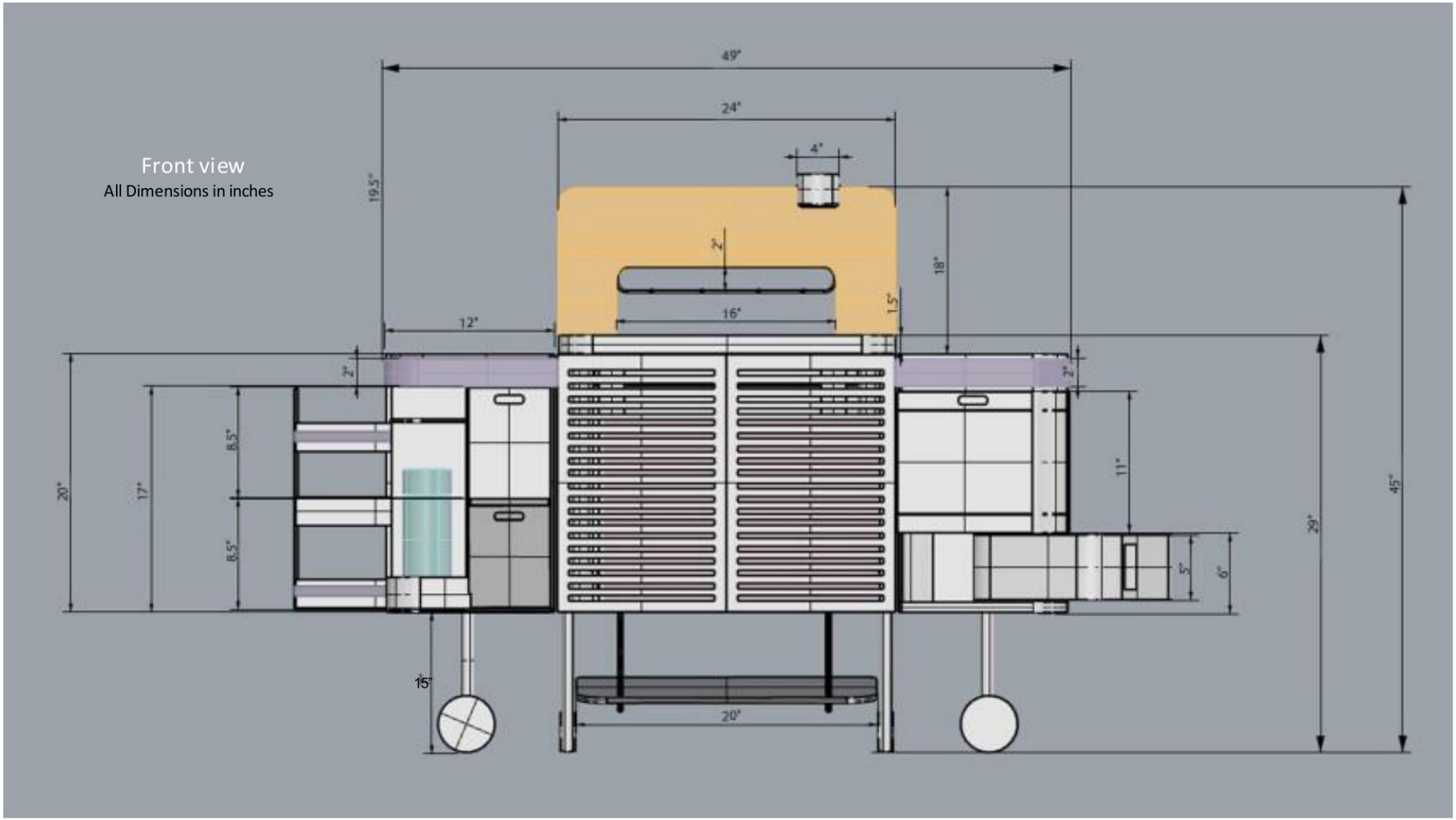

Space for planning task/
sticky notes
Wireless
charging station
Rod & hooks for
hangable objects
Sliding planter
Indentation to keep objects
Inbuilt speakers
Mobile/ipad
holder slot

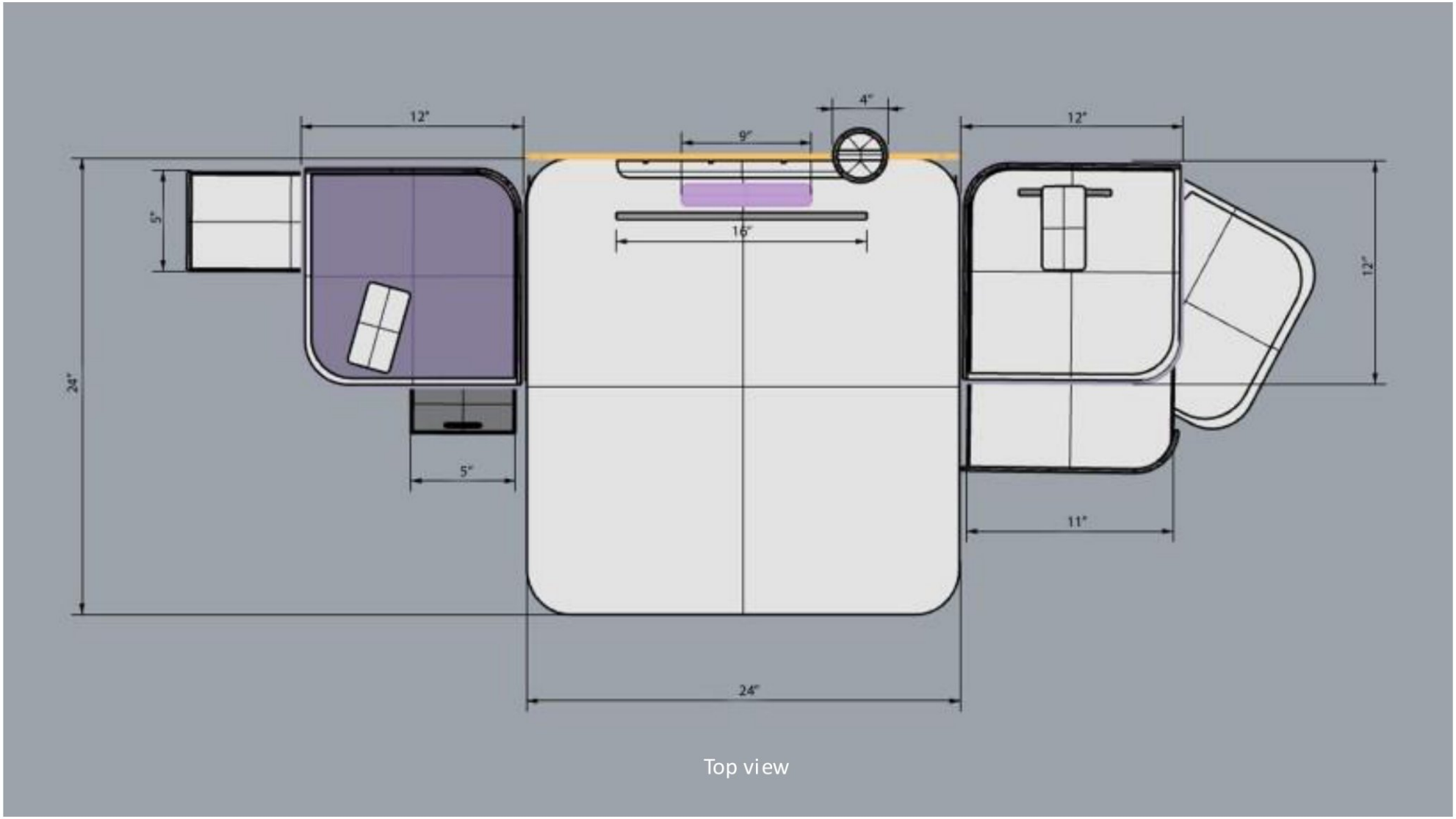

Removable back panel
Power sockets for devices
Internal power connection
Retractable chord– single power supply to rest of power inputs inside
Wire manager and Hidden storage space for charger adapters


Extra electronic devices
storage space
Pull out multilevel tray
stationery organiser
storage space for books
and notebooks
storage space for loose
papers and files
Bottle storage space
Dustbin – easy to pull and
discard paper waste
Adjustable Foot rest

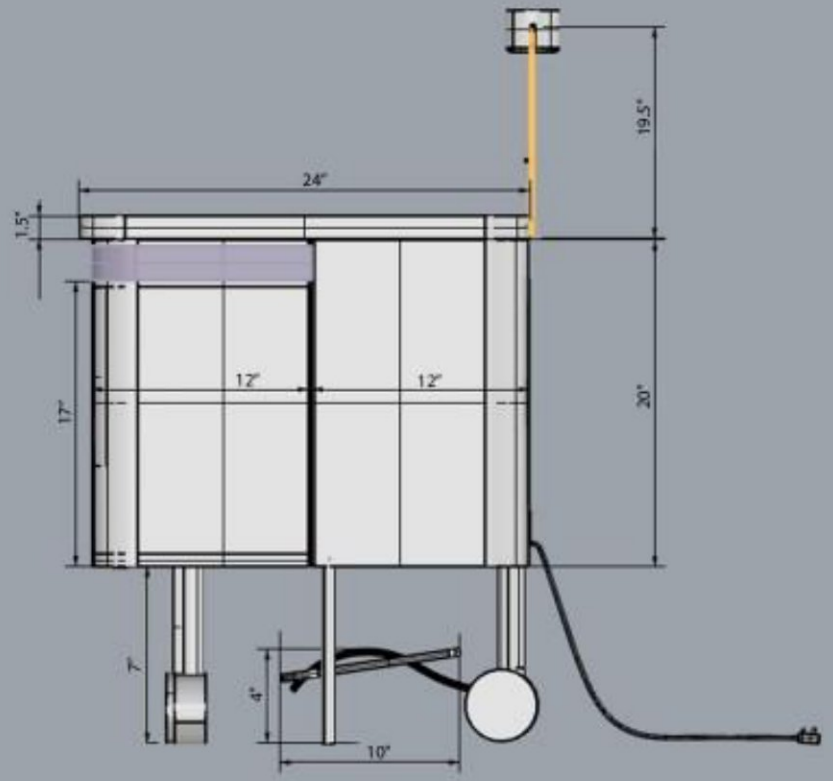

Wireless charging station
CPU storage
Adjustable Foot rest
Food and beverage counter

Design dimensions





Top view

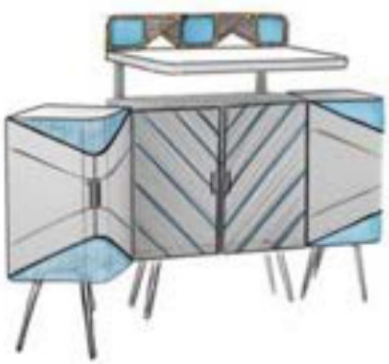


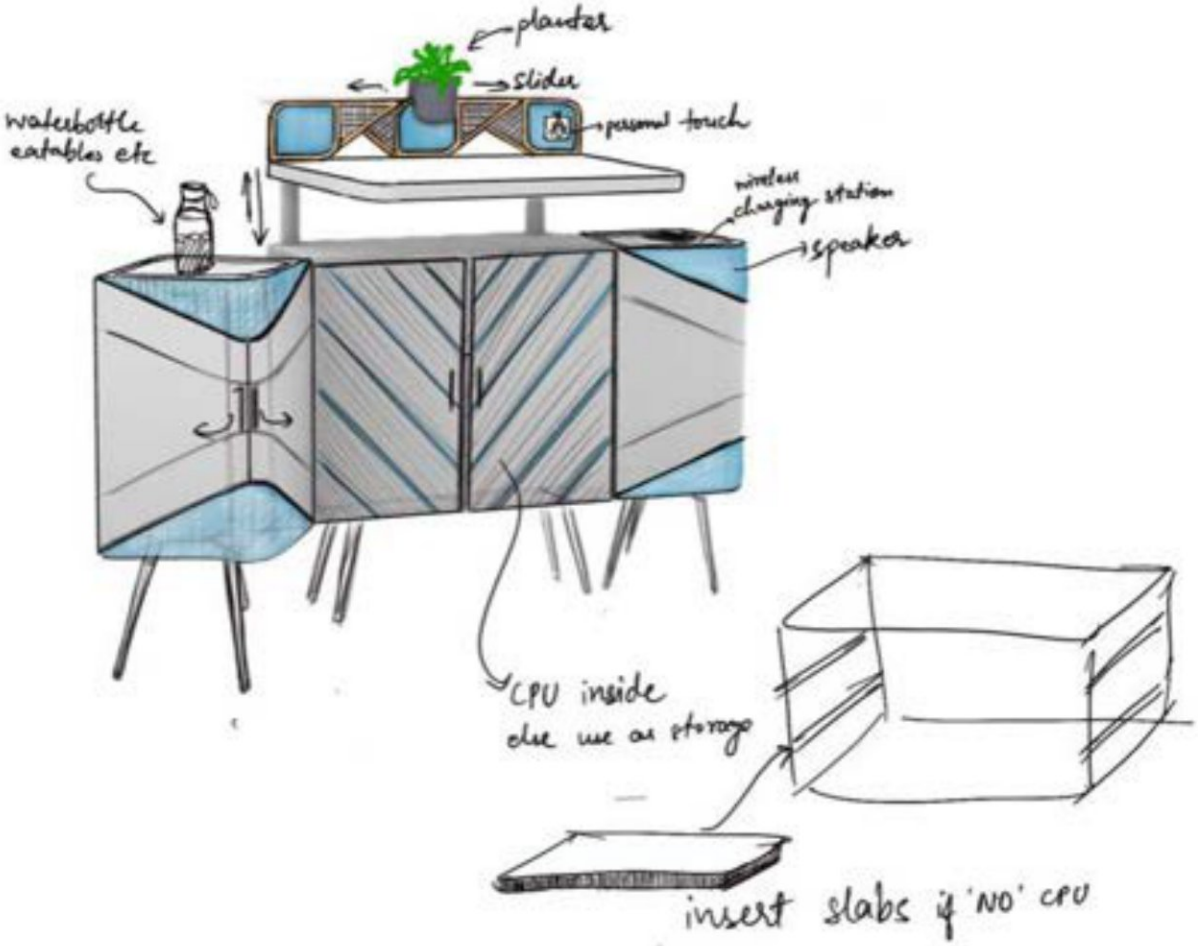
Side view

Stylization mood board 1

- curves
- Inclined lines
- soft
- Mid-century modern

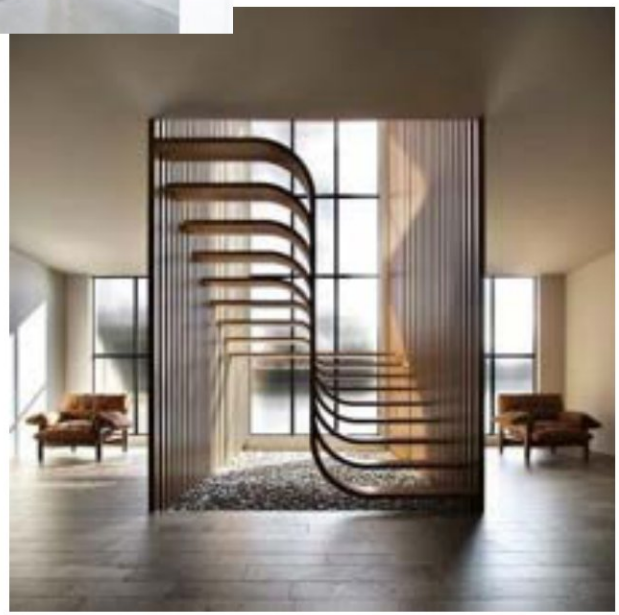
Visualization 1



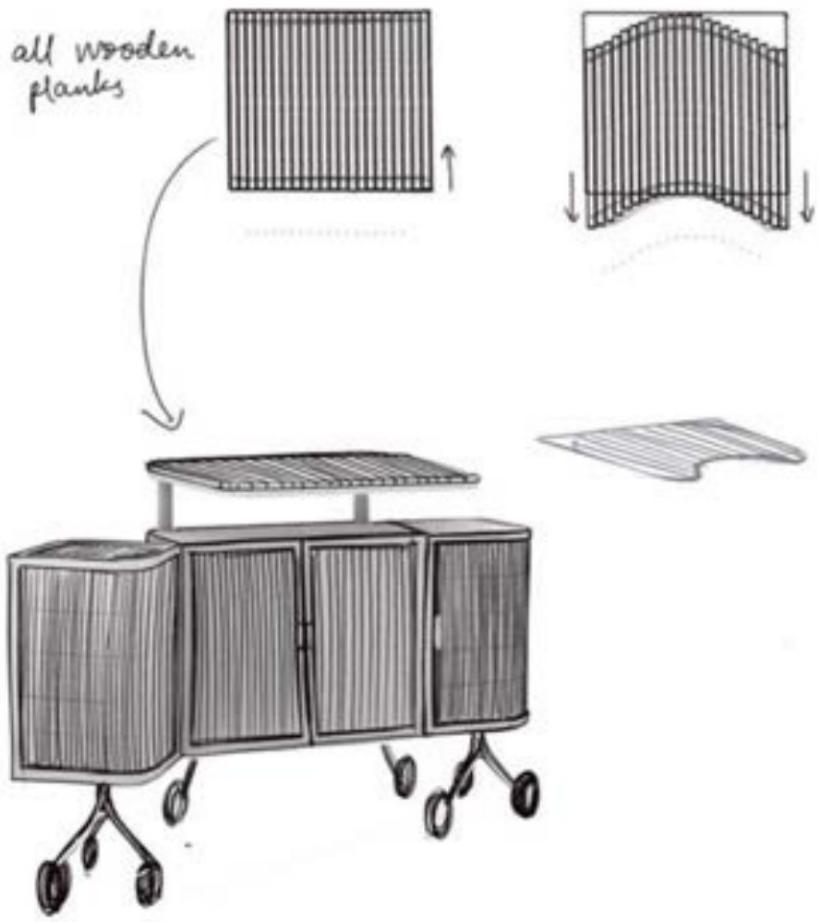


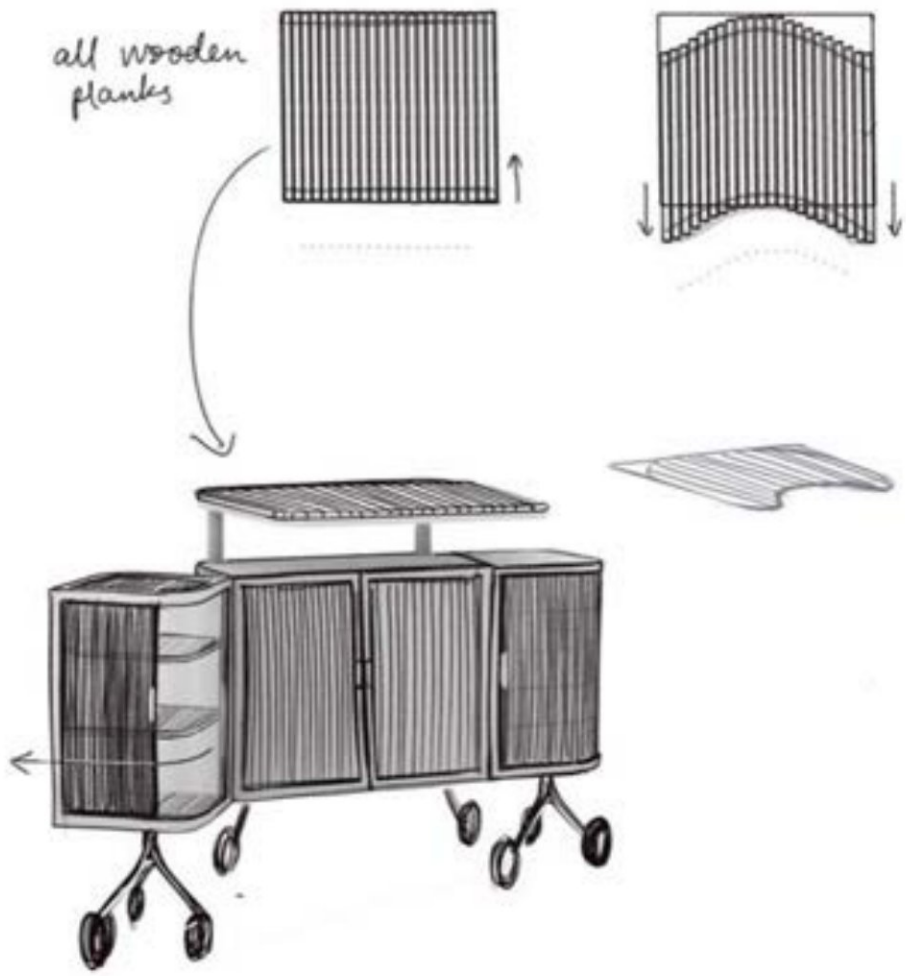
Stylization mood board 2

- Lines
- Repetition
- Cohesive
- movement



Visualization 2

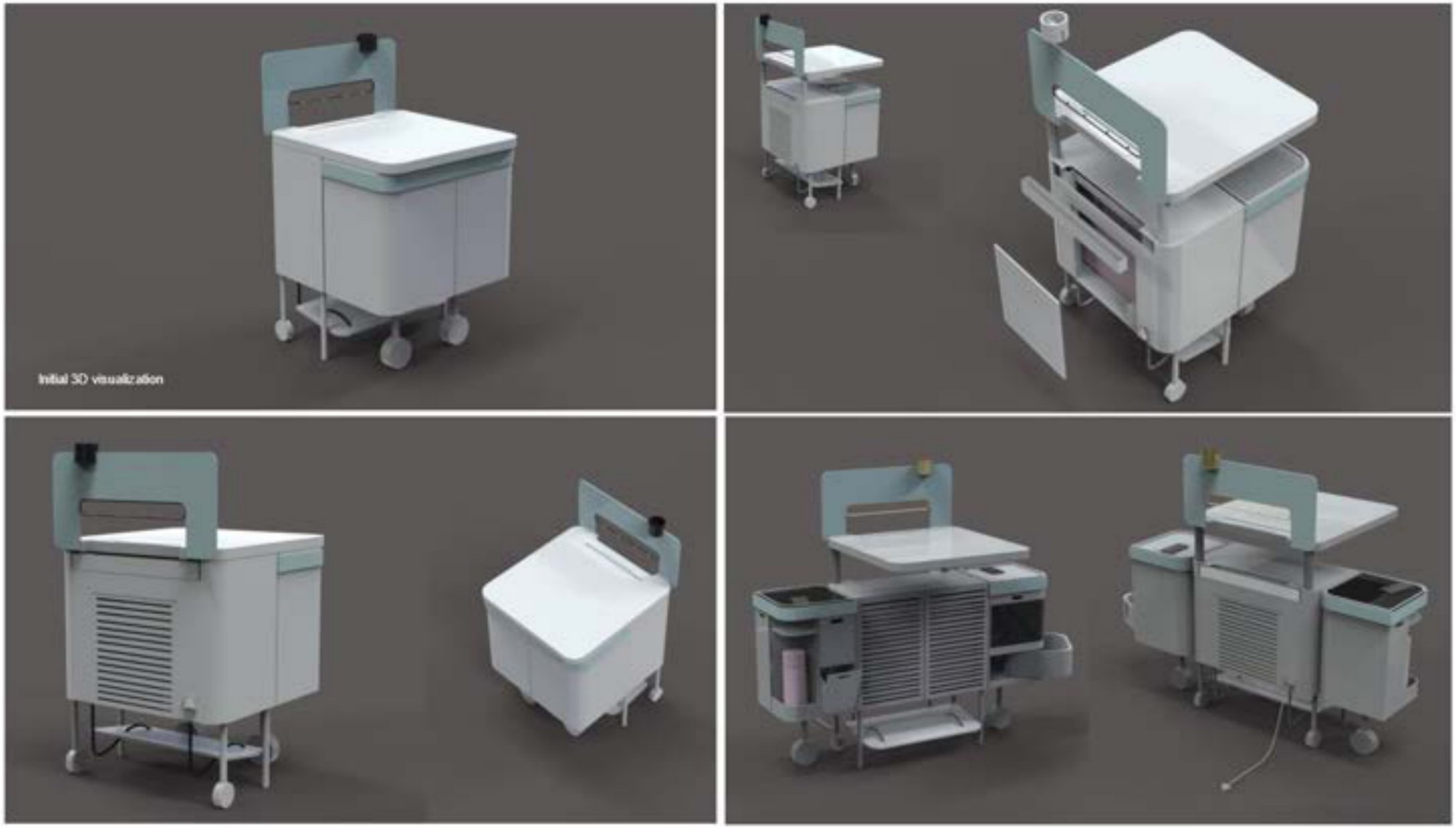




Stylization mood board 3

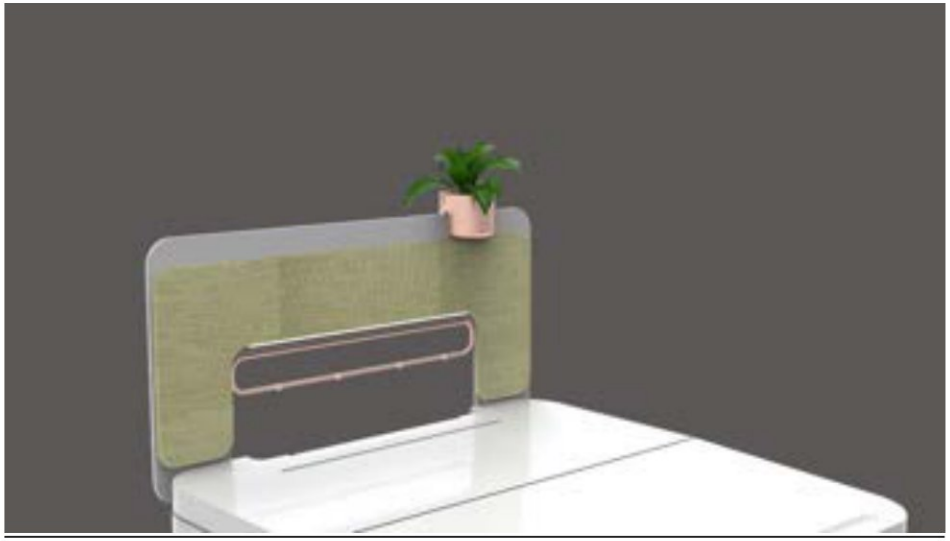
- curves
- minimal
- subtle
- smooth

Visualization 3 – modern aesthetics



6.7.5. FINAL 3D MODEL

Smart mobile workstation




• Compact
• Portable
• Height adjustable
• Ample storage
• Visual comfort
• Smart interface

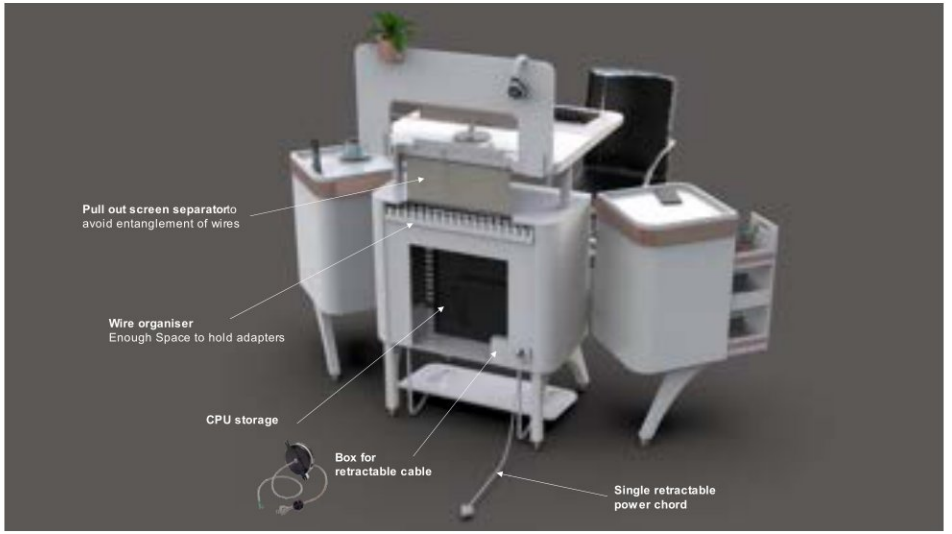

Unfolds to become a
fully functional
workstation

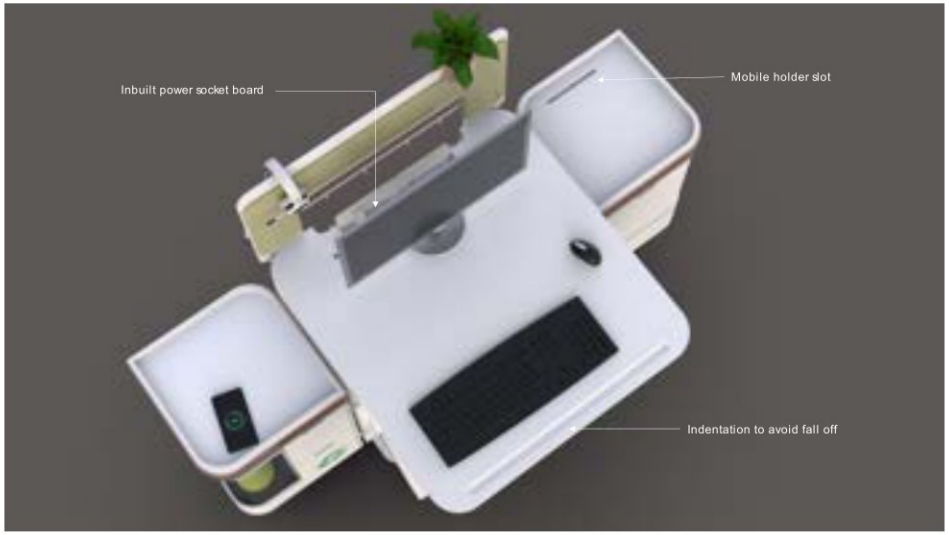

Height adjustable
Stand and work


Sit and work


Pull out screen separatorto
avoid entanglement of wires
Wire organiser
Enough Space to hold adapters
Single retractable
power chord


Left side storage unit
Wireless charging station
Pull our stationery organiser
Bottle storage space
Extra storage
dustbin
Angle adjustable foot rest
Right side storage unit
Mobile holder
Food and beverage counter
Book shelf
Pull out closed storage
(paper, files etc)


Pull out screen separatorto
avoid entanglement of wires
Wire organiser
Enough Space to hold adapters
CPU storage
Box for
retractable cable
Single retractable
power chord


Inbuilt power socket board
Mobile holder slot
Indentation to avoid fall off


Planter can be adjust by simply sliding


Digital interface
Control music and other mobile notifications
Meeting reminder
Plant for pleasant view
10:00
Meeting
Weather & time
Organiser for hangable products


Ipad / mobile holding slot
Inclined surface for hand support
Wireless charging station

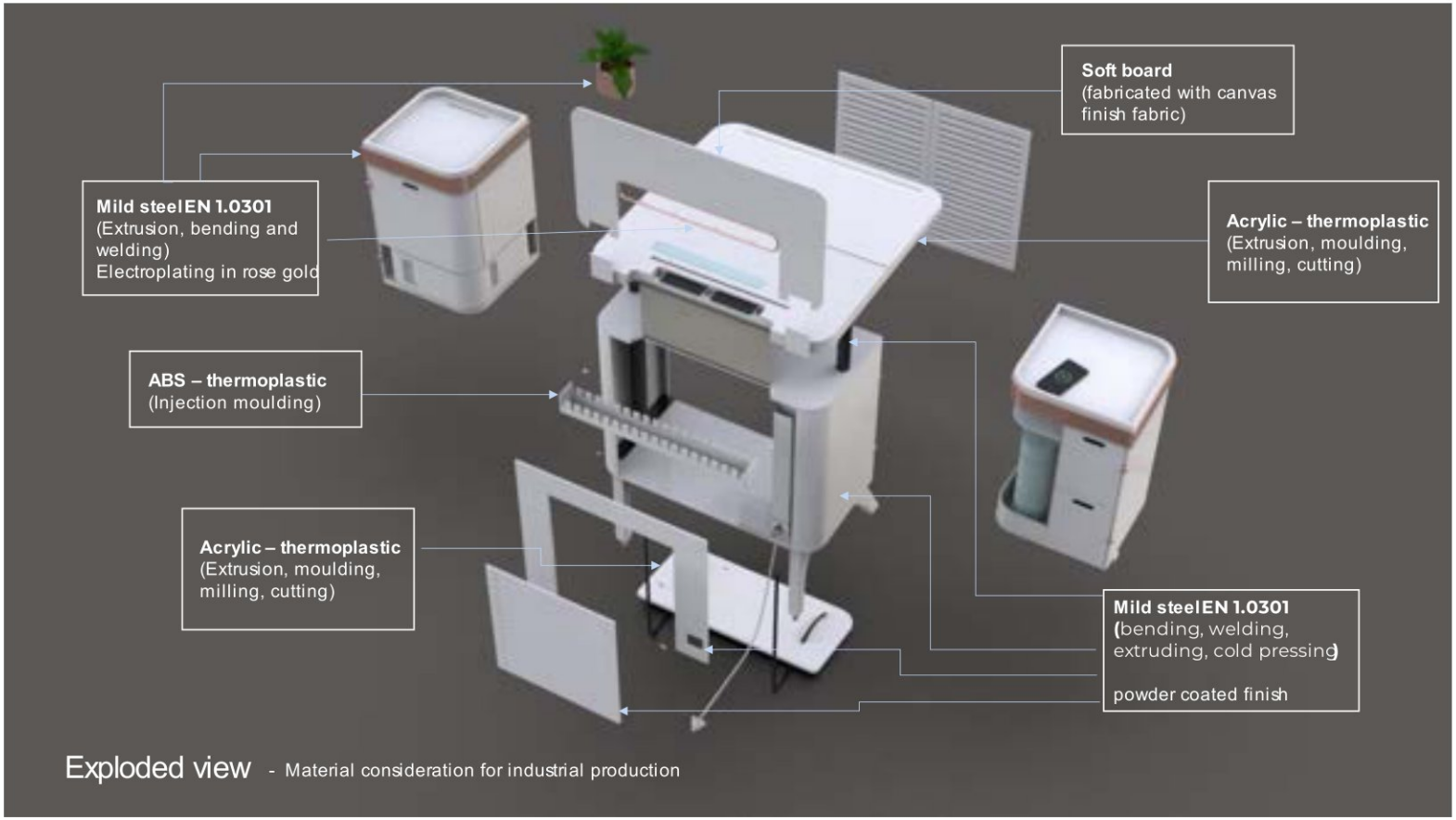
Indoor setup

Outdoor setup

6.7.6. MATERIAL CONSIDERATION

Material consideration for industrial manufacturing

1. For structure – sheet metal (stainless steel - SS 304 grade)
2. Powder coating for clean and matt finish
3. Table top – wooden block (50mm thick)
   Heat pressed laminated engineered wood (50 mm thick)
4. Drawers – ABS thermoplastic

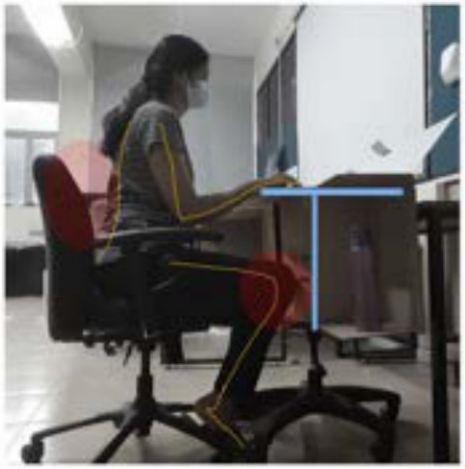


6.7.7. FINAL DESIGN PROTOTYPE

Rig testing

Insights from Rig testing

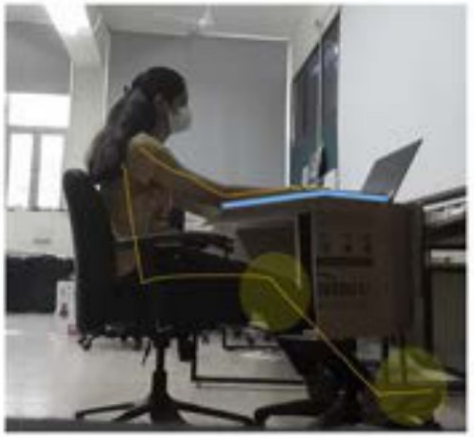
Dimensions of the rig constructed using corrugated sheet box are as shown below. The size of entire setup is slightly less than the actual dimension consideration because of the availability of the material.



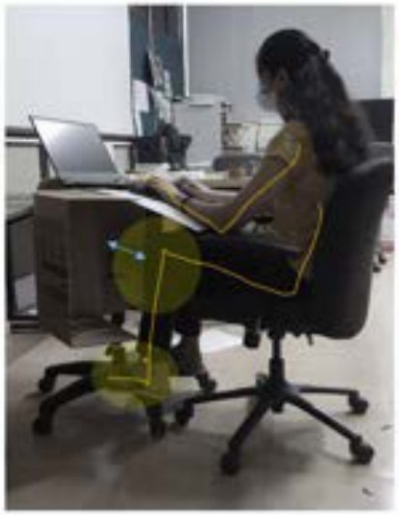
- Less surface area on table top
- Knee hitting front surface
- No back and arm support

- Knee hitting front surface
- Increased surface area of table top
- Better leg clearance than previous
- Still Knee touching front surface

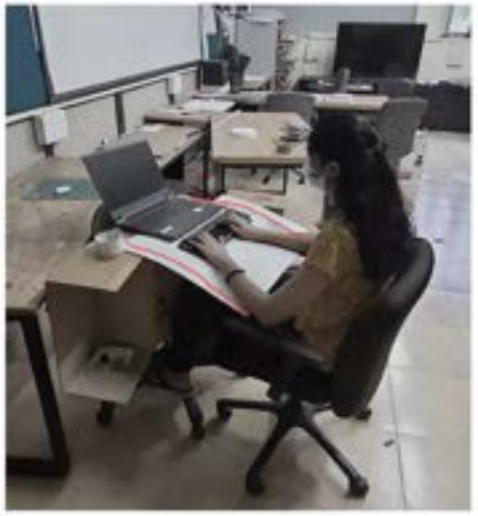
- Extended surface of table top
- Better knee and leg clearance



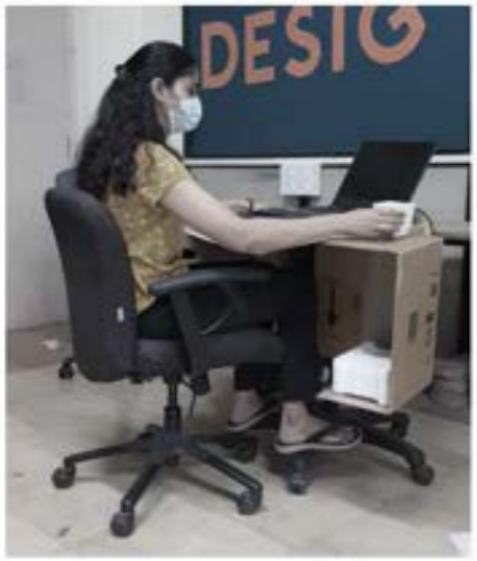
- Extended leg
- Good foot clearance



- Acceptable margin between knee and front surface of table



- Extended surface of table top
- Better knee and leg clearance



- Object movement

<u>Final prototype</u>

<u>Material consideration for prototype</u>

8mm MR grade plywood for the structure of the furniture – since this is good in strength hence using it for the prototype to test the overall movement, load bearing capacity, leg and hand clearance

PVC pipe 25 mm diameter

<u>POC prototyping</u>

Procuring Material

8mm plywood

1” Screws, ½ “screws, 1” nails, 25mm, 30 mm dia Pvc pipe

Aluminium L section, Aluminium C section, sun board

Material preparation tools

Jigsaw Cutting

Sanding

Drilling

Laser cutting

Manual cutting

Assembly

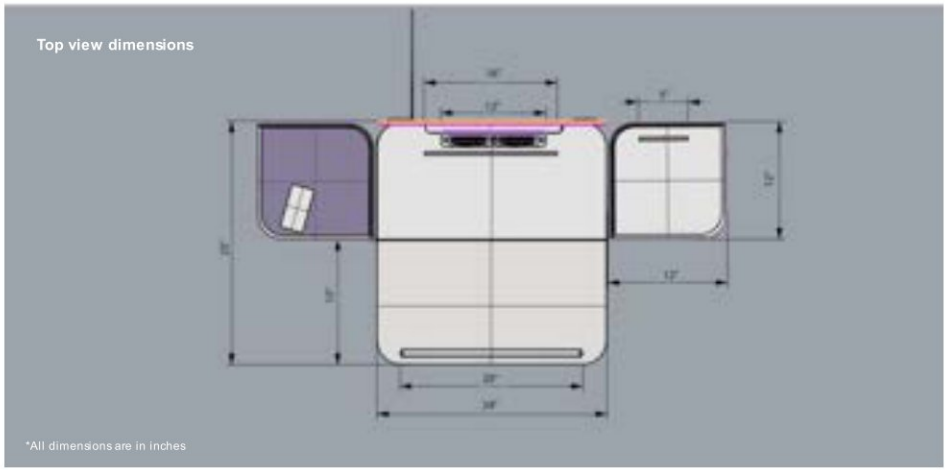
Plywood structure using nails and screws

Telescopic arrangement for height adjustment

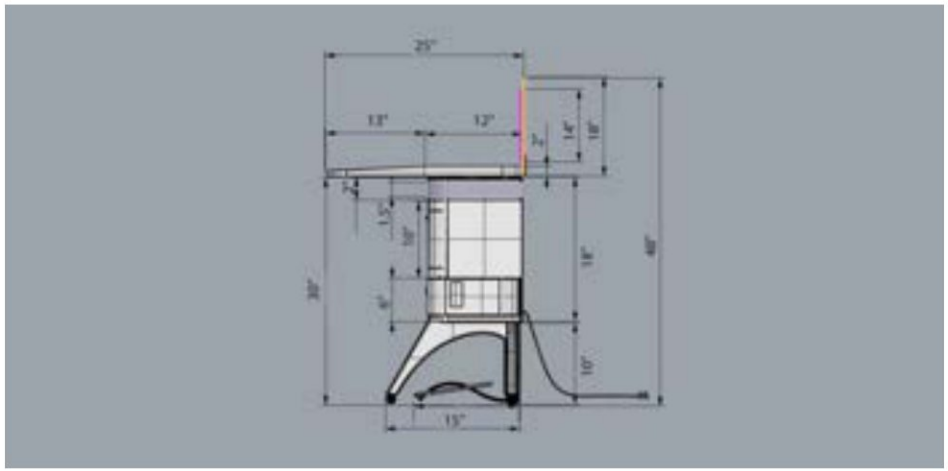
Attaching doors with hinges and screws

Dimensional drawings

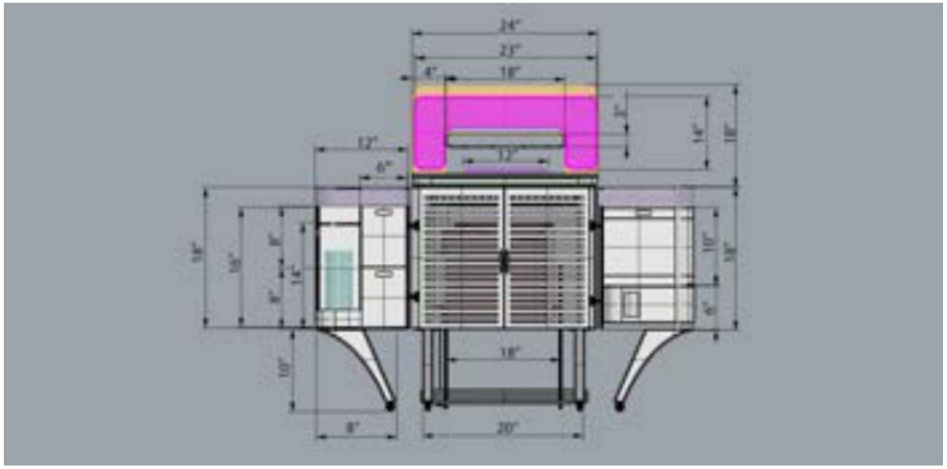
Revised dimensions



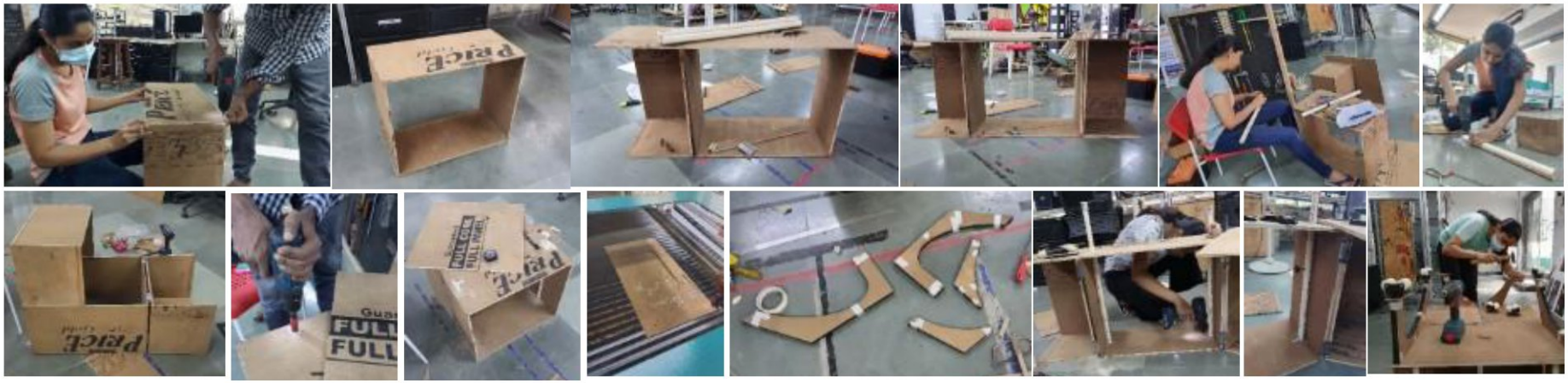
Right side view - dimensions



Front view - dimensions

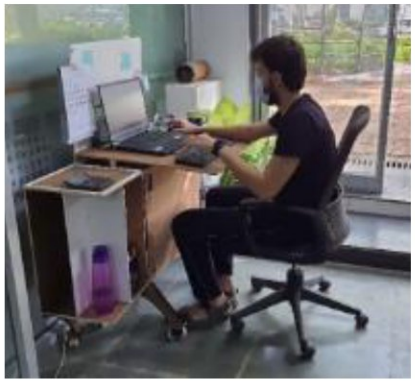
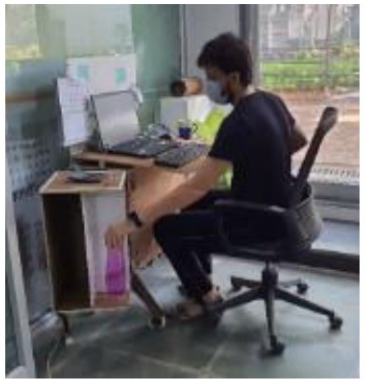
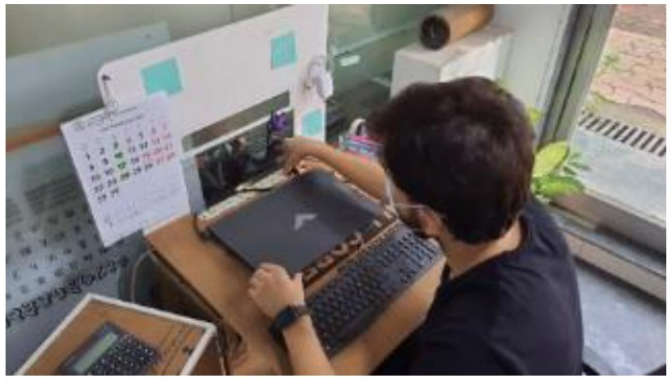
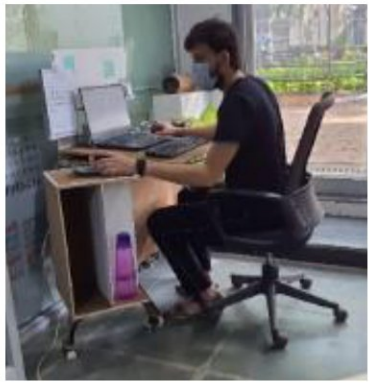


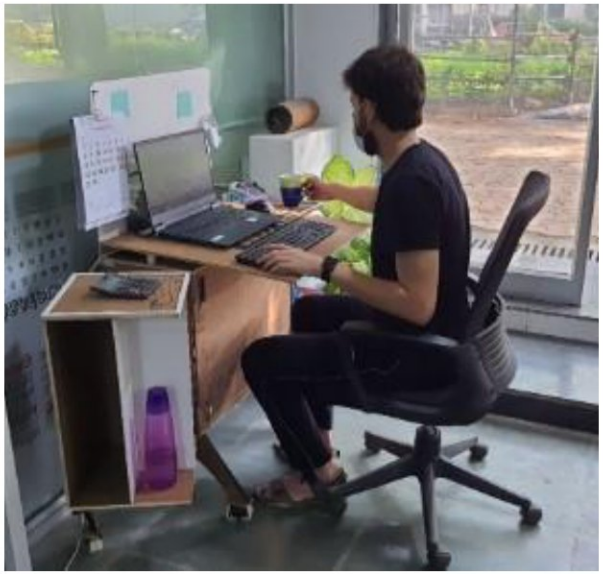
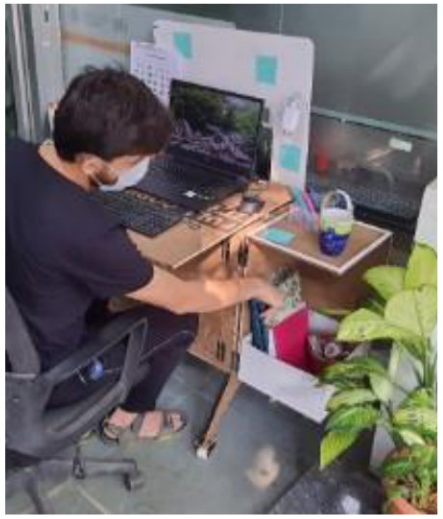
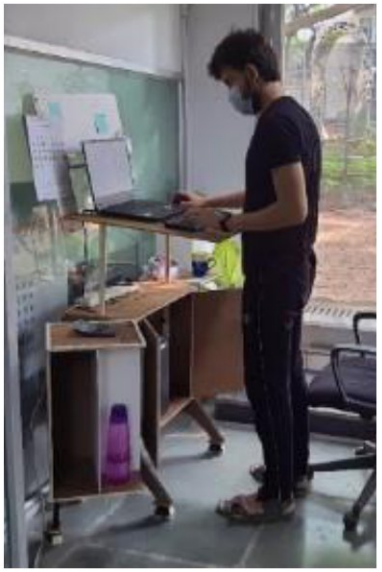
Working in lab



Proof of concept Prototype

User testing 1- indoor

Standing posture ➞

User testing 1- outdoor



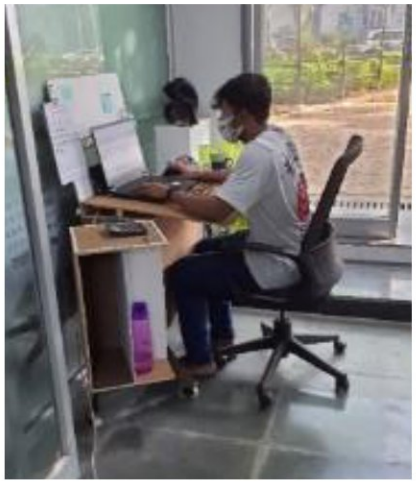





- **Foldable**
- **Good to carry around**
- **Wheel are well aligned**

- Standing feature is good but doesn't suit his requirement
- Feels that the overall form is complex

User testing 2







- **Good Foldable feature**
- **Collapsible front board**
- **Good overall functionality and space division**
- **Feels relaxed to sit out and work**

- Felt that leg stretching was obstructed due to CPU space
- There could be a pull table top for more leg room

6.8. FINAL DESIGN ANALYSIS

Final design is a foldable table which unfolds to become a fully functional work desk. Its height adjust feature allows user to use it in two modes which is working while standing and working while sitting. The mobile unit allows user to move around in the house if bored of working at same location for long. The design has further scope of improvement on usability part to make it a perfect fit for user to buy.

6.9. USER FEEDBACK

Based on the above user testing it was found that the concept was nice and the indoor and outdoor features helped people to move around and the change in environment helped refreshen their mind in the ongoing pandemic scenario which in a way helped their productivity. Though there is a scope of improvement in the design for better usability for further market development but overall response turned out to be appreciable.

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