

# Modelling and Dimension Analysis of a Multipurpose Convertible Laptop Table Using Autodesk Fusion 360

Nitesh Pandey, Manish Kumar, Pankaj Gupta, Amit Kumar Srivastava

**Abstract**—The convertible table is a versatile and adaptable item designed to provide numerous solutions in one. The design incorporates numerous features that offer both ease and functionality. The description of the versatile convertible table in this overview encompasses a range of features that can be tailored to accommodate various user requirements. With its changeable functionality, this piece can easily transform into a workstation, dining table, or coffee table to suit various needs. Significantly, this multipurpose convertible laptop table includes a specific section for electronic devices such as computers and tablets, offering convenience for remote workers and online learners. In addition, providing storage space for essential equipment promotes a tidy workspace by facilitating the organization of many items. The integrated flash system offers supplementary illumination for dimly lit surroundings, while the cooling fans prevent the table's surface from overheating in hot weather or during prolonged laptop usage, making it an optimal and superior choice for laptop users. In order to cater to the needs of students, painters, and other individuals who require writing tools on a regular basis, a pencil and pen stand is included, hence enhancing the versatility of the table. The scissor lift mechanism allows for easy modifications in height, making it convenient to customize usage and providing the option of using it as a standing desk. Overall, this convertible table exemplifies its ability to adapt, its user-friendly nature, and its usefulness in a wide range of situations and settings.

**Keywords**—Furniture design, laptop stand, study table, learning tool, furniture manufacturing, contemporary design.

## I. INTRODUCTION

TABLES are frequently utilized in diverse environments for a plethora of functions including dining, studying, working, and other activities. They can be fabricated from various materials such as wood or stone and are offered in a variety of shapes and sizes [2], [19]. There is a wide range of table designs available in the market to cater to the specific requirements of users. Furthermore, tables can function as an ornamental object to enhance the aesthetic appeal of a room [1], [20].

The design of a table incorporates several models and principles of ergonomics, taking into account the user's requirements and the table's usability. Users' preferences for table design and mechanism are influenced by aspects such as age, gender, and height. The majority of the tables possess distinctive designs and offer great flexibility and portability. However, there is a requirement for a table that is both adaptable and can serve as a study table in addition to other situations. It will have practical use in various other scenarios,

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such as transporting a laptop or carrying stationary items.

A convertible table is a multifunctional and adaptable table specifically built to serve many uses, including dining, studying, and functioning as a laptop desk [4]. The table is collapsible, facilitating convenient storage and utilization in compact areas. The table is fitted with a scissor lift mechanism that allows the user to easily modify its height according to the preferences. This feature enhances the usability of the table when seated on a chair or reclining on a bed, providing more comfort.

In addition to its foldable functionality, the convertible table offers various other user-friendly features. The product is equipped with two drawers that offer ample storage capacity for items such as books, pencils, and other accessories. The table is equipped with a stand for holding stationary items such as pens and pencils, as well as a cup holder, making it an ideal choice for studying or working. Convertible tables offer a pragmatic and adaptable alternative for individuals seeking furniture that can be easily adjusted or for those with limited room [14].

Firstly, the table is equipped with adjustable stands that allow customers to personalize the height according to their preferences, whether it be for utilizing it as a workstation, dining table, or coffee table. It assists the user in adapting the altitude of the aircraft according to the requirements and circumstances.

Additionally, the table includes a specifically allocated area for laptops or tablets, enabling remote professionals or online students to work in a comfortable manner. The incorporated cooling fans in the table serve the purpose of maintaining a cool surface, particularly in hot weather or during extended laptop usage.

Furthermore, the table is equipped with LED lamps that offer supplementary illumination, enabling work to be carried out in poorly lit surroundings. For avid readers, this table is ideal as it offers a built-in light source, making it a perfect companion for book reading. The lamp's versatility enhances the functionality of the light source, allowing it to be effortlessly accommodated within the designated space [6].

Another advantageous feature is the compact tool organization area, such as a pencil and pen stand, which offers a designated space for storing writing instruments such as pens, pencils, and markers, among others. This function is especially advantageous for students, artists, or individuals who need frequent access to writing instruments.

The table is equipped with a compact sliding platform that serves as storage for small objects, ensuring a neat and well-organized workspace. The table's adjustable mechanism facilitates its portability and transportability. It is suitable for

usage when lying in bed. The adjustable leg of this item allows it to fit into small spaces and is useful for modifying its height. A convertible table is a sophisticated piece of furniture designed to be utilized both indoors and outdoors. It is equipped with several features that offer ease and functionality.

Finally, the table may be elevated to a specific height using a scissor lift, enabling users to customize the height for various individuals or to utilize it as a standing desk. Furthermore, it can be optimized on a personalized level, taking into account the specific circumstances.

In general, the convertible table is a multifunctional piece of furniture that can be utilized for diverse functions and in various settings, offering ease and practicality. Table I displays the classification of tables, which consists of 34 unique categories.

## II. BRIEF DESCRIPTION

- A. The convertible table is notable for its outstanding versatility, making it an excellent option for individuals who spend a considerable amount of time working at a desk or studying. The device's exceptional capacity to not only modify its height but also its angle empowers users to meticulously tailor it to their exact requirements. By adopting a personalized approach to workstation ergonomics, individuals are able to optimize their productivity and enhance their comfort levels [15]. In addition, the table's design is meticulously created to encourage prolonged periods of efficient work or study. The user-friendly characteristics of the product facilitate a smooth and uninterrupted experience, hence promoting prolonged user engagement in various tasks. In addition to its practicality, the product also has environmentally friendly features, which is in line with the current emphasis on sustainability [3], [8]. Moreover, its adaptable design accommodates people across all age demographics, guaranteeing that it fulfills the varied requirements of users. Essentially, this convertible table embodies a groundbreaking and comprehensive answer for a diverse array of workstation needs.
- B. The left desk of the convertible table is particularly remarkable due to its inclusion of a built-in laptop stand that incorporates a noiseless cooling mechanism. This functionality is especially advantageous for individuals who regularly utilize their computers, as it can effectively mitigate the risk of overheating and enhance overall operational efficiency. The inclusion of sliding drawers and substantial storage capacity for accessories enhances convenience, allowing customers to effortlessly retrieve their supplies [20].
- C. The right side of the table is specifically designed for efficient studying, with a smooth surface that is ideal for writing and reading. This divided arrangement facilitates efficient multitasking, allowing users to utilize the right side for laptop activities while keeping the left side for writing and reading materials. This well-considered layout improves efficiency by offering designated areas for

various activities. The table's segmented design provides both comfort and organization, whether one is working on digital assignments or using actual books. This purposeful design accommodates the specific requirements of both digital and conventional study methods, rendering it a versatile resource for dedicated learners.

- D. The convertible table not only has practical features, but also showcases a modern design that effortlessly enhances different room styles, making it a versatile addition to any area. The sleek aesthetics of the product contribute to its sophisticated appearance, allowing it to seamlessly integrate into various environments [9], [10]. In addition, the table includes a convenient night lamp feature, which makes it more suitable for studying or reading at night. Its versatility is the true distinguishing factor, as it provides several modes to accommodate a wide range of needs. The comprehensive design approach not only improves its functionality but also adds to its visual attractiveness. The convertible table goes beyond simple usefulness; it presents itself as a fashionable and adaptable item that enhances both appearance and purpose, making it a sensible and sophisticated option for many users and environments.
- E. Overall, the convertible table is an outstanding option for anyone seeking a flexible and productive office. The notable characteristic of this product is its versatility, which is achieved via the use of changeable components and integrated conveniences that greatly enhance both productivity and comfort. With a focus on inclusivity, this design accommodates people of all ages and easily adjusts to many types of work environments. This table is a great addition that boosts functionality and provides convenience. It is a must-have for individuals who value a well-rounded and user-friendly workspace solution.
- F. The convertible table's overall features and compatibility are meticulously built based on careful observation of users' daily demands. Primarily, its advantages are beneficial for students in their academic pursuits. Having a suitable study platform that can serve several purposes and also accommodate essential items is beneficial for improving study efficiency.
- G. A workplace-specific coffee stand provides a practical option for coffee aficionados. Positioned at the table's center, it keeps the coffee temperature optimal for a prolonged duration. This inventive stand serves individuals who relish coffee during work hours, guaranteeing a delightful, hot cup during their tasks.
- H. Positioned above the coffee section, a generously-sized compartment offers ample storage for pens, pencils, and an assortment of items. Within this space, one can neatly arrange up to 18 pens or pencils in a row, ensuring easy access and organization. Beneath this specialized holder lies additional space for accessories, cleverly concealed by a lid. This design provides a practical storage solution that not only fosters workspace tidiness but also promotes orderliness. It is a thoughtful addition to the convertible table, enhancing its functionality and making it a

convenient and organized workspace for various tasks.

- I. With a foldable design, this table suits compact spaces perfectly. Its scissor lift mechanism enhances user-friendliness, allowing for height adjustments tailored to individual preferences. Whether seated on a chair or reclining on a bed, the table offers heightened comfort. It is especially beneficial for individuals who enjoy reading or watching movies while reclined, effortlessly

accommodating diverse scenarios. The foldable nature ensures easy storage, optimizing space in confined areas. This mechanism not only provides ergonomic advantages but also highlights the table's adaptability [5], [12]. By prioritizing the comfort of those engaged in activities like reading, movie-watching, or relaxation, this table meets the demands of modern living with its versatile, multi-functional design.

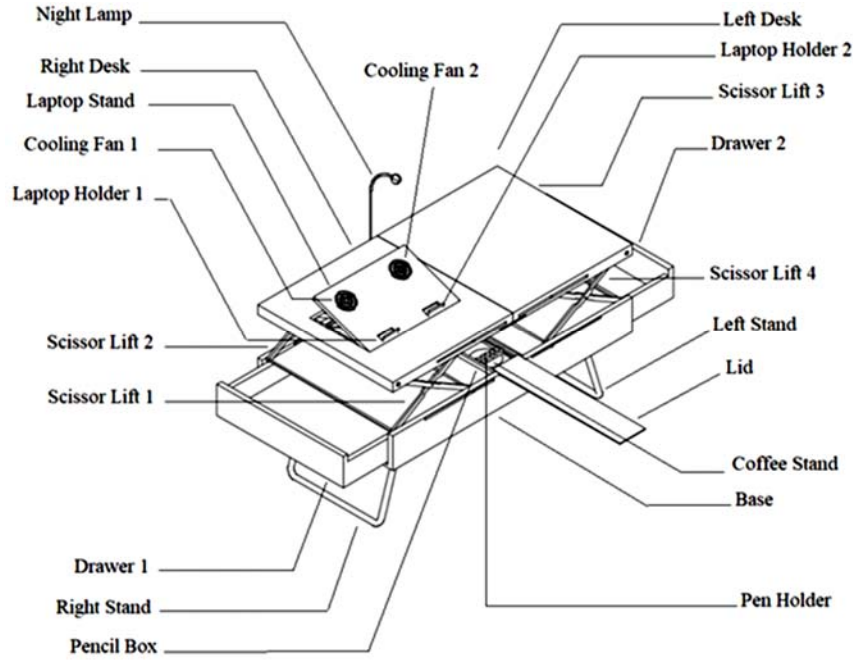


Fig. 1 Convertible table's parts



Fig. 2 Basic requirement of tools during study

### III. MARKET ANALYSIS

In order to attain efficient studying or productive work, a

multitude of indispensable goods are necessary – such as books, notebooks, pens, pencils, and, of course, a proper work

surface. To enhance efficiency and simplify these essential requirements, some core accessories become indispensable. These encompass a pencil stand for organizing writing utensils, a laptop stand designed for laptop users, and frequently a cooling mechanism to prevent computers from overheating after prolonged usage. Moreover, it is vital to have a shelf or drawer for book storage in order to uphold an organized workspace. For individuals involved in nocturnal study or work sessions, a night lamp functions as an essential instrument, offering the required illumination without causing disturbances to others. Workspace choices typically differ among persons. While some individuals like the traditional arrangement of a desk and chair, others choose a more casual approach, such as working from their bed with a tiny chair or cushion for added comfort. Furthermore, in a workplace setting, individuals may like to have a specifically designated area for their coffee or beverages, which would allow for convenient access throughout the day [7]. These accessories play crucial roles in improving productivity and creating an efficient, personalized environment for studying and working, as depicted in Fig. 2. They accommodate the varied requirements and inclinations of individuals in their quest for efficiency and convenience, thereby enhancing the effectiveness and enjoyment of the workspace. Based on the market study, this article has determined that there are six items that are predominantly desired by users or pupils, as depicted in Fig. 2. The discrete components pose spatial constraints, and purchasing each item individually is not cost-effective. In order to optimize the utilization of space, enhance comfort, and maximize cost-effectiveness, this study proposes a method for the development of a new product, as seen in Fig. 8. The invention should incorporate all of these aspects in

an optimized manner across all contexts. We begin the analysis by sketching the elements, taking into account individual components and optimizing their size. The objective is to condense the functionality into a single table and incorporate it into a cost-effective table.

Selecting an ideal study table is a crucial choice that greatly influences an individual's learning and efficiency. When choosing a table for small children, it is crucial to opt for one that is specifically built to be safe and comfortable for them. Children seek out furniture with smooth contours and low-maintenance surfaces, which, stimulate their creativity with various playful patterns, that the table is ergonomically positioned to encourage proper body alignment. This table introduces more storage solutions for school materials, with a particular focus on robustness to withstand their active play [13].

Teenagers benefit from desks inspired by the convertible table's adaptability. Table has adjustable options viz. space for laptops, books, and personalized space. For adults, functionality, comfort, and style are key points to consider. Thus, prioritizing the ergonomic design, workspace and storage with desk that complements the room's decor is also the requirement in table. Quality and durability are vital, along with a comfortable chair and proper lighting. Older individuals require comfort and accessibility.

To summarize, the process of choosing an appropriate study table entails customizing the selection to suit the particular requirements of the user, be it young children, adolescents, adults, or elderly folks. Every age group possesses certain prerequisites that must be taken into account in order to establish an optimal study setting that fosters both learning and productivity.

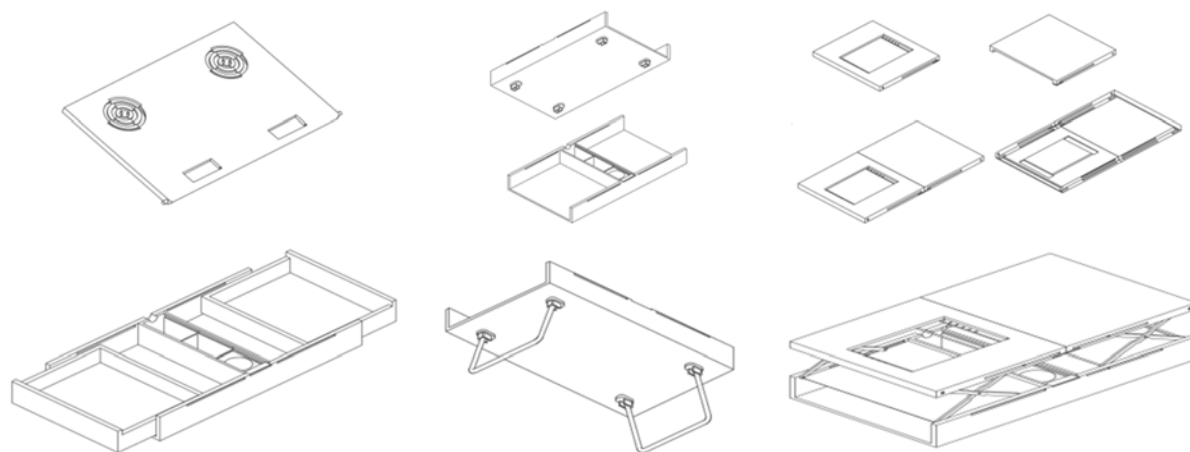


Fig. 3 Deformation contour

#### IV. IDEATION

Multiple discrete objects are frequently utilized during study or work periods. Consequently, there is a rise in expenditures and a lack of order in the work environment. Therefore, in order to accomplish the objective, we devised a creative solution that combines all of these elements in the versatile table. The idea was derived from the necessity to

streamline and arrange a disorganized workspace. The clever model combines all the essential components into one, providing users with a diverse and excellent solution. It eliminates the need to purchase individual items, therefore freeing up valuable workspace and saving money. The utilization of drawers as an improvised solution highlights the importance of a streamlined user experience, ensuring that

everything is conveniently accessible through effective design. The convertible table, with its design, is not only very functional but also enhances the visual appeal of any environment. Conveniently, this product includes designated compartments for each necessary item, minimizing the inconvenience of making several purchases. In response to the global trend towards valuing efficiency and cost-effectiveness, the table aims to optimize and enhance the methods individuals employ in their job and studies, resulting in well-structured and productive settings. By selecting specific materials, table demonstrates a commitment to being

environmentally responsible. The use of wood in this product enhances its durability and promotes environmental sustainability. The table is transformed into an eco-friendly and highly sustainable option due to the carbon sequestration properties of wood. The carbon separation is attributed to its enhanced potential for CO<sub>2</sub> absorption. It streamlines and improves the work and study experience while advocating for environmental sustainability and economic efficiency. The ultimate goal is to establish harmonious and efficient workspaces for all users [16], [17].

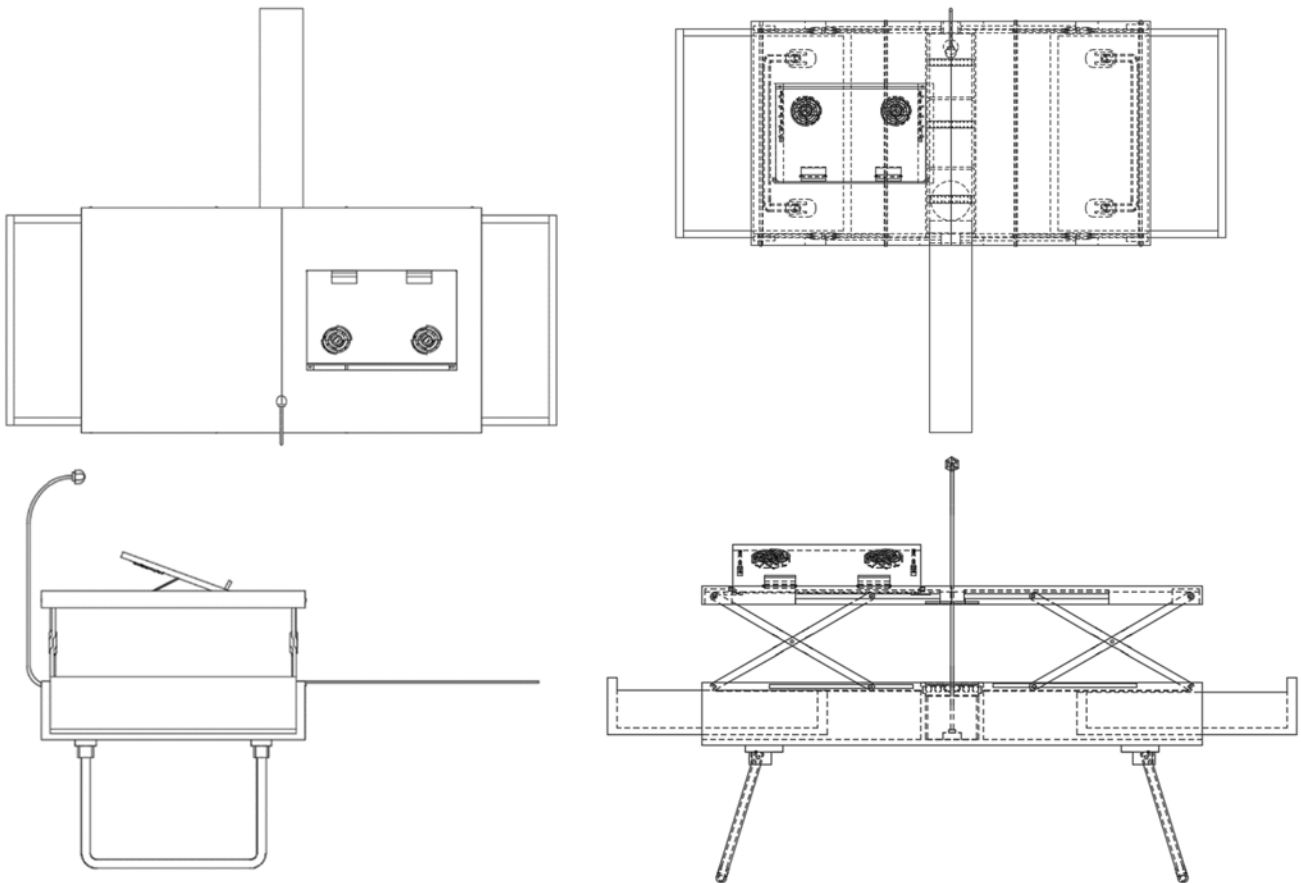


Fig. 4 Line diagram of final table

#### V. CONCEPTUAL DRAWING AND SKETCHING

The process of product development commenced by methodically collecting all the components outlined in Fig. 2. These aspects functioned as the fundamental components for pioneering design. The creation of the sketch for the convertible table was directed by a distinct vision: each necessity had to be fulfilled with meticulousness. In Fig. 3, culmination of dedicated efforts is presented as a detailed line diagram. This sketch was meticulously crafted with unwavering attention to all the conditions and demands that had identified. The aim was to offer a versatile and all-encompassing solution. Within the sketch, you will observe a thoughtful integration of various components. The designated specific spaces for accessories, ensuring easy access and

organization for users. To acknowledge the importance of adequate lighting, especially for tasks performed during the late hours or reading, a lamp was strategically placed at the center of the table. This placement ensures uniform illumination throughout the whole surface of the table. An outstanding characteristic of the design is the scissor lift mechanism, which allows users to easily change the height of the table to accommodate various jobs and personal preferences. Beneath this mechanism, two drawers have been ingeniously built to allow for easy access from the sides and may be effortlessly extended outward. It offers ample storage capacity for books and other items. These drawers provide a generous amount of storage capacity for books and various odd goods. The convertible table features incorporated folding legs at its base, which enhances its practicality. The inclusion

of these legs allows for easy storage and transport, making the product versatile and suitable for many settings and needs. Essentially, a convertible table surpasses the traditional notion of a table. The workstation is a carefully designed and versatile environment that combines functionality with creative design, meeting the various requirements of users in a unified and harmonious framework [18]. We have designated space between the drawers to conveniently store pens, pencils, and other accessories, ensuring they are kept organized and easily accessible. Given the diverse requirements of users, there is a need for a viable solution to maintain the temperature of beverages during work sessions. In order to satisfy this demand, the table has design modifications that smoothly incorporate a coffee stand. This feature guarantees that customers can enjoy their beverages at the optimal temperature while fully absorbed in their duties. Furthermore, our strong dedication to functionality and ease of use led us to

strategically position a night lamp in the center of the table. The strategic placement of the light source guarantees that the entire surface of the table is evenly lit, enabling efficient and comfortable studying or working, even at night. In addition, we implemented proactive methods to protect the contents of the drawers. There are protective lids between the drawers and the table top. These lids serve as a safeguard, guaranteeing that accidental spills or liquid accidents do not jeopardize the contents contained inside the drawers. This considerate inclusion maintains the integrity and usability of the stored items. Essentially, a convertible table goes beyond being simply utilitarian; it encompasses a harmonious combination of carefully selected design aspects that appeal to a wide range of user needs. The primary emphasis is on ensuring convenience, productivity, and the protection of important goods that are essential for a productive and well-organized workspace.

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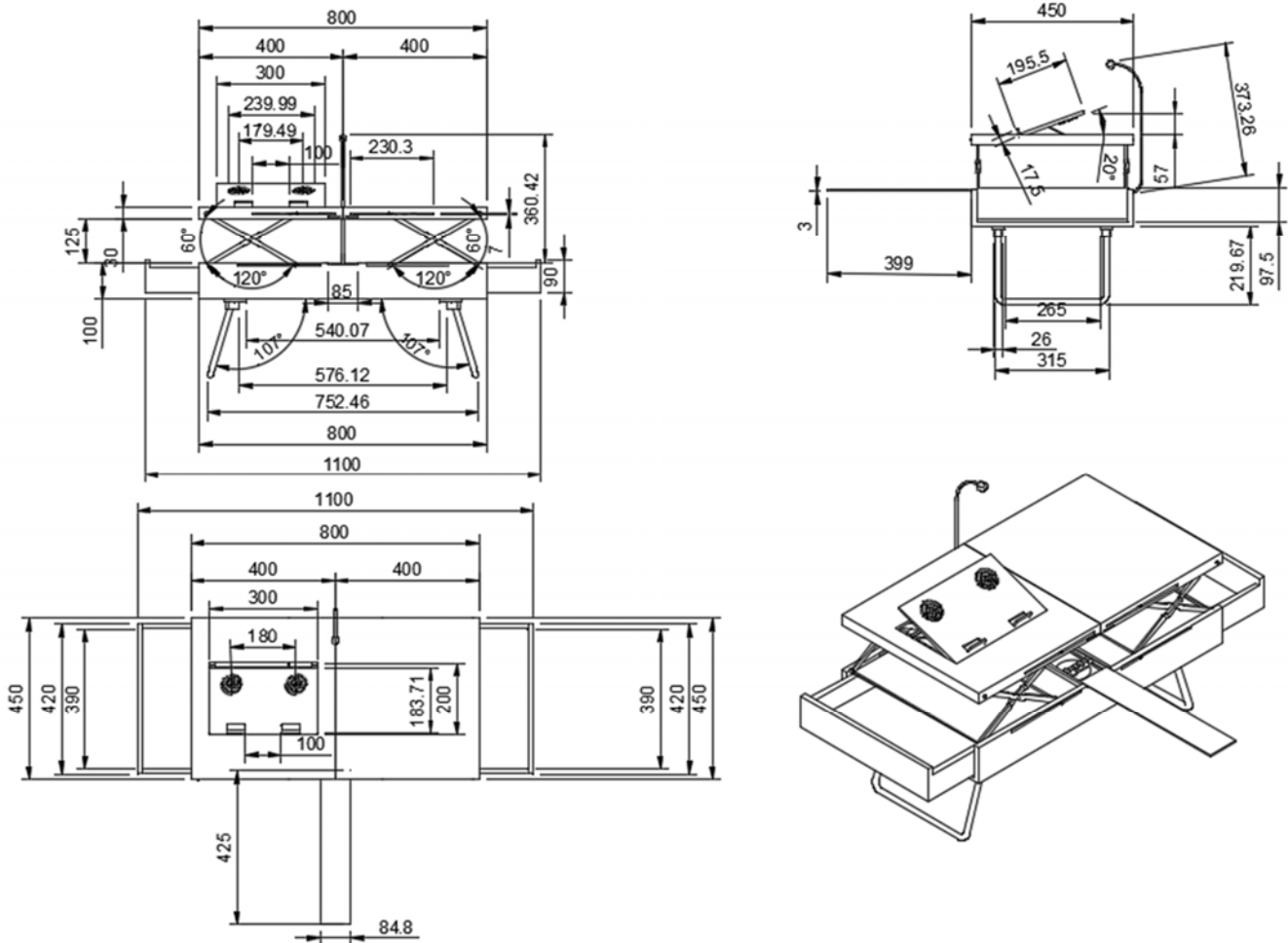


Fig. 5 (a) Dimensions (in mm) of table

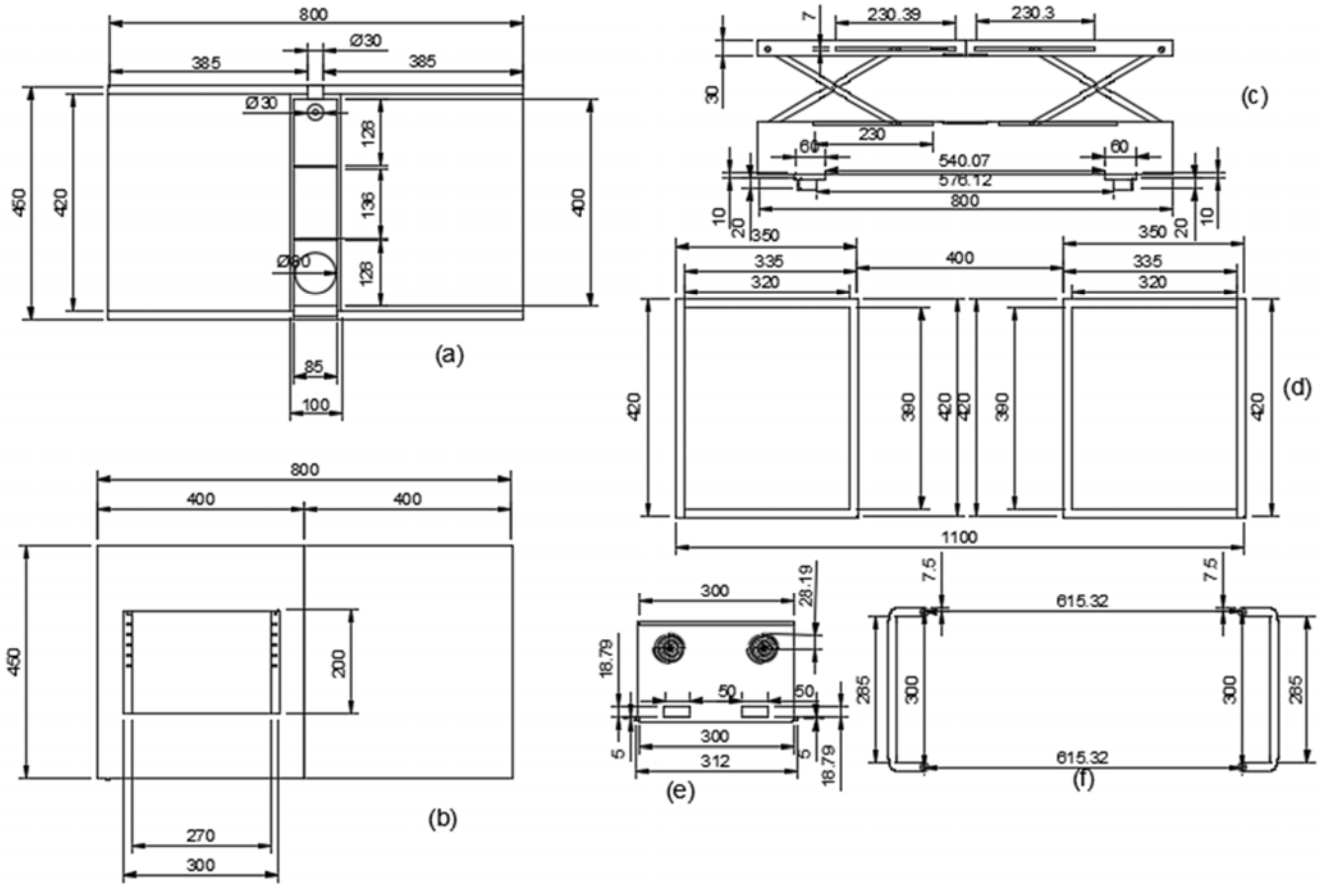


Fig. 5 (b) Dimensions of table parts (in mm) as follows: (a) Table base (b) Table top (c) Adjustable mechanism (d) Left – right drawer (e) Laptop stand (f) Table legs

## VI. TECHNICAL DRAWING

The convertible table is a refined and complex piece of furniture, consisting of a precise arrangement of 37 distinct components, as indicated in Fig. 7. Every individual component has been meticulously crafted and flawlessly incorporated to provide an outstanding and versatile user experience. The table has dimensions of 800 mm in length, 450 mm in width, and 340 mm in height when the scissor lift mechanism is in its reduced position. This well-considered design guarantees its seamless integration into a wide range of locations, providing a spacious surface area that is suitable for work, study, or other duties. An exceptional characteristic of this table is its scissor lift mechanism, which contains a rod of 290 mm in length. This ingenious system allows users to easily change the height of the table, making it suited for various activities and adapting personal preferences, thereby improving ergonomic comfort. Furthermore, the table is furnished with a specialized laptop stand, which has dimensions of 300 mm in length and 200 mm in width. This specially designed area ensures the safe positioning of computers and other devices, enhancing the efficiency and arrangement of the workspace. In addition, we included custom-made drawers that have specific measurements of 420 mm in length, 350 mm in width, and 70 mm in height. These drawers offer ample storage space for books and various

goods, ensuring a neat and organized workspace. The table is equipped with a set of pen holders, each capable of holding up to 18 pens, for the convenience of users. This deliberate inclusion guarantees that writing tools are easily available and organized in a tidy manner.

In order to enhance the user experience, the table is equipped with a coffee stand measuring 80 mm in diameter and 68 mm in length. This provides a handy location to keep beverages easily accessible during work or study periods. To summarize, a convertible table is a precisely designed furniture item that seamlessly combines practicality and ease of use. The meticulous design and flawless incorporation of many elements make it a perfect workspace that caters to a wide array of jobs, consequently boosting productivity and comfort.

## VII. DESIGN DESCRIPTION

Autodesk Fusion 360 is a software developed by Autodesk specifically designed for 3D modeling, simulation, animation, and other related tasks. The model is created using Fusion 360. By transforming hand-drawn sketches into a three-dimensional model that accurately reflects the shape and dimensions depicted in the provided figure. Four components and the whole assembly are shown in Fig. 5. We begin the process of developing individual components, as depicted in



Fig. 3 and arrives at the ultimate one depicted in Fig. 4. The objective was to accurately translate the complex elements depicted in Fig. 4 while effectively incorporating the intricacies shown in Fig 5 [11]. With an unrelenting commitment to exceptional quality, we deliberately select durable and resilient materials that reflect the same standards found in luxury furniture. This dedication guarantees that the convertible table will endure for a long period of time. In addition, we aim to enhance the user experience by integrating textures that accurately mimic the physical feelings connected with the product. With this thorough approach, we have given

vitality to a groundbreaking idea, providing a concrete and immersive experience with a convertible table that seamlessly combines usefulness and aesthetic charm. Fusion 360 generates 6 preset colors, which are used to represent each component of the table with a different color. This software utilizes color-based differentiation of components, which aids designers in their work. The current model is in the development phase, which is why it is using the default color. However, in the final version, it will be transformed into the desired material color and look. The author has already converted it into a wooden material, as shown in Fig. 8.

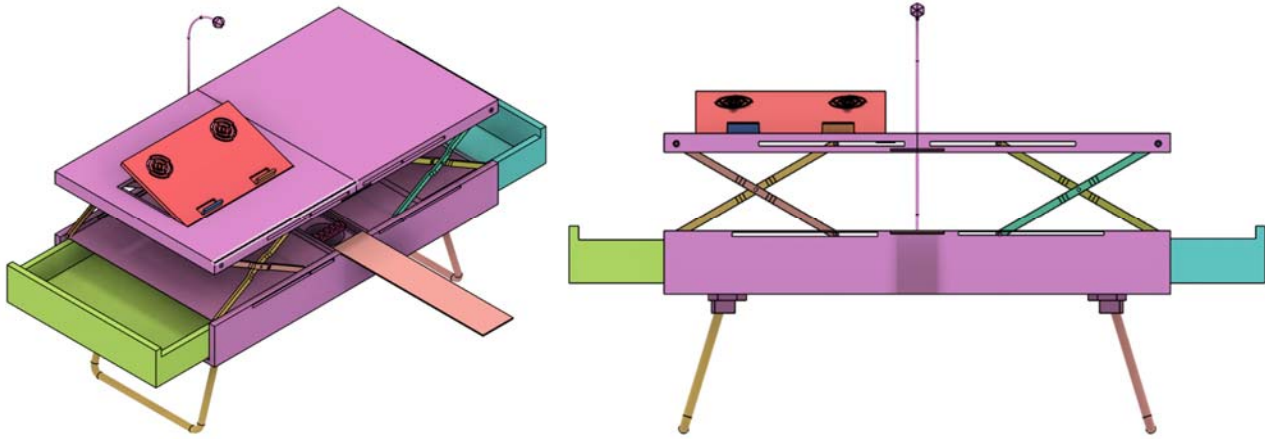


Fig. 6 Design model made on Autodesk Fusion 360

TABLE I  
 USABILITY OF TABLES

Category	Table
Dining tables	dining table, kitchen table, bar table, bistro table
Living room tables	coffee table, accent table, console table, end table, drink table, c-table
Office and work tables	computer table, conference table, work table, study table
Various style and material tables	metal table, glass table, wood veneer table, marble table, solid wood table, industrial table, farmhouse table, nested table, vanity table, wall-mounted table, drop-leaf table patio table, foyer table, folding table, mid-century modern table, laminate table, minimalist table drum table, picnic table, conference table

There are 3 types joints to assemble the parts:

- Rigid Joint
- Revolute Joint
- Slider Joint

The rigid joint is used to join to components strongly while revolute is used to rotate the child component in reference to the parent component. Other joint such as slider joint is used to slide the components. The drawers are attached by a slider joint because they must slide along the base. The scissor lift mechanism to adjust height of the table is attached with the revolute joint. Some other parts like laptop stand, fan, legs etc. need to be joined using a revolute joint. And remaining components which do not need any movement are attached while using rigid joints with the base. After applying joints, the model is shown in Fig. 6. The perspective and front views of the table are now shown in Fig. 7. The next step includes

the texture control. The appearance as shown in Fig. 6 is steel which is software's default material selection. The selection of material depends on the application and need. In most of the application the table is made of wooden material as shown in Fig. 7. We can change it according to the requirements. There are various material's properties are available in the fusion 360 software which can be optimized as per the requirements.

### VIII. CONCLUSION

The conclusions drawn from this research are summarized as follows since it is focused on identifying the need of the convertible table and modelling and innovative product:

1. The need of the table for students and working table is studied in which study table need multiple features as compared to normal tables are assembled in this study.
2. In addition, since a single table is used in multiple works and for this the adjustable mechanism is successfully analyzed and added to the convertible table.
3. The table is designed with the help of ergonomics concept for tables and especially for students' users. It simplifies the user experience by combining various components into one, reducing the need for separate purchases and optimizing space and functionality.
4. The convertible table is a highly versatile and adaptable piece of furniture, tailored to cater to the diverse needs of users in various environments.
5. The software used for modelling and sketching this convertible table is Autodesk Fusion 360.



6. The valuable addition product with an efficient, eco-friendly, and user-friendly workspace solution has been created with the study.

Parts List					Parts List				
Item	Qty	Part Number	Description	Material	Item	Qty	Part Number	Description	Material
1	1	Laptop_stand_right_fan		Acetal Resin, Black	29	1	Right_top_base		Oak, Red
2	1	Laptop_stand_left_fan		Acetal Resin, Black	30	1	Right_slider_top_left_rod		Aluminum
3	1	Table_left_stand		Aluminum	31	1	Left_slider_right_rod		Steel
4	1	Table_right_stand		Aluminum	32	1	Left_slider_left_rod		Steel
5	1	Left_drawer		Cherry	33	1	Left_slider_top_right_rod		Aluminum
6	1	Right_drawer		Cherry	34	1	Left_slider_top_left_rod		Aluminum
7	1	Laptop_stand_left_holder		Cherry	35	1	Right_drawer_cover_plate		Oak, White
8	1	Laptop_stand_right_holder		Cherry	36	1	Left_drawer_cover_plate		Oak, White
9	1	Laptop_stand		Cherry	37	1	Lamp		Aluminum
10	1	Laptop_stand_right_fan_motor		Iron, Malleable					
11	1	Laptop_stand_left_fan_motor		Iron, Malleable					
12	1	Laptop_stand_left_supporter		Steel					
13	1	Laptop_stand_right_supporter		Steel					
14	1	Front_right_slider_first		Aluminum					
15	1	Front_right_slider_second		Aluminum					
16	1	Back_right_slider_first		Aluminum					
17	1	Back_right_slider_second		Aluminum					
18	1	Front_left_slider_first		Aluminum					
19	1	Front_left_slider_second		Aluminum					
20	1	Back_left_slider_first		Aluminum					
21	1	Back_left_slider_second		Aluminum					
22	2	Front_pen_holder		ABS Plastic					
23	1	Mid_pen_holder		ABS Plastic					
24	1	Storing_compartment_cover		Cherry					
25	1	Base_link		Oak, Red					
26	1	Left_top_base		Oak, Red					
27	1	Right_slider_right_rod		Steel					
28	1	Right_slider_left_rod		Steel					

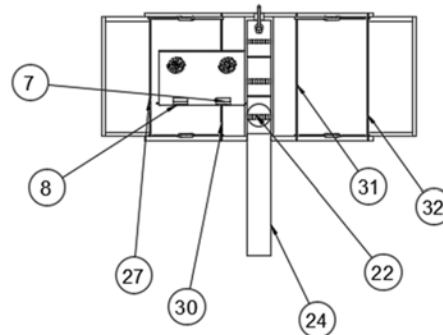
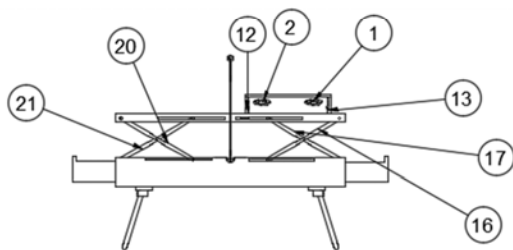
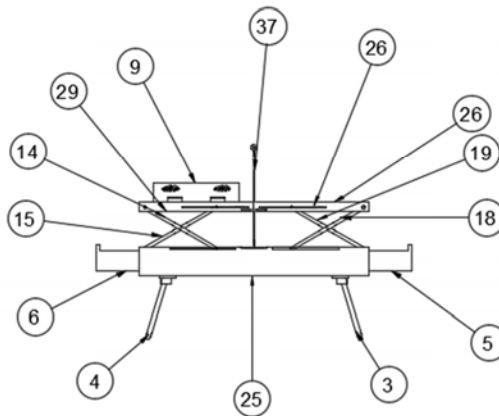
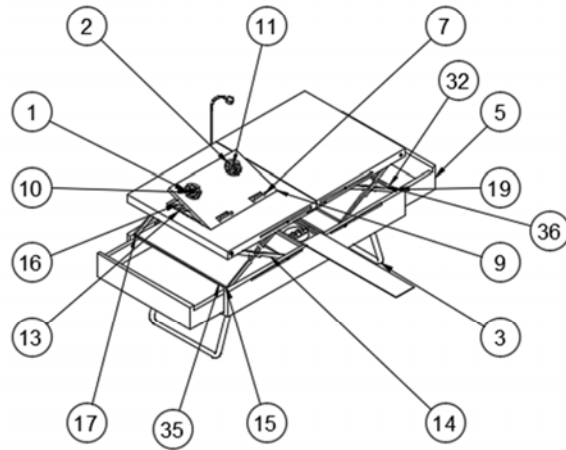


Fig. 7 Material selection and texture control



Fig. 8 Complete model with texture and fabrication

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