

Review Article

Designing Ergonomically Equipped Professionalism Equipment for Artists and Orators

Nitesh Pandey¹, Amit Kumar Srivastava¹, Pankaj Gupta¹

¹Jaypee University of Engineering and Technology, Guna (M.P.), India.

I N F O

Corresponding Author:

Nitesh Pandey, Jaypee University of Engineering and Technology, Guna (M.P.), India.

E-mail Id:

niteshpandey46974@gmail.com

Orcid Id:

<https://orcid.org/0009-0006-2878-075X>

How to cite this article:

Pandey N, Srivastava AK, Gupta P. Designing Ergonomically Equipped Professionalism Equipment for Artists and Orators. *J Adv Res Mech Engi Tech* 2023; 10(3&4): 42-49.

Date of Submission: 2023-11-20

Date of Acceptance: 2023-12-20

A B S T R A C T

The beauty of stage is somewhere depended on a piece of equipment called lectern or a stand. The symbol of professionalism depending on the occasion, make it versatile and having many forms. All orators and musicians use various equipment during their presentation. One of the common equipment that is used is a lectern or a podium. Mostly musicians use an adjustable stand which works as a podium for them. The design of that stand for musicians, book readers, etc., should be adjustable and ergonomically so that they can spend more time without any fatigue and pain. It also boosts the confidence and give the structure to the orator with carrying necessary items like notes, laptop etc. Sometimes there is an unavailability of podium stand due to its structure and weight. To solve this problem a multifunction stand is designed with ergonomic concepts. It is an adjustable, lightweight, highly functional, and easy to carry equipment for orators. The design is made to hanger the notes, laptop or necessary tools. The conversion of stand into a small cylindrical shape makes it easy to carry.

Keywords: Podium, Multifunction Stand, Ergonomics, Furniture Design, Stage Equipment, Autodesk Fusion 360

Introduction

In the realm of public speaking and musical performances or in a rhetorical domain, the role of a lectern or podium plays as a pivotal element, contributing significantly to the aesthetics and functionality of the stage.⁷ These pieces of equipment serve as symbols of professionalism, adapting to the different occasions and events. Orators and musicians both use a broad spectrum of tools and accessories to enhance their performance, and among these, an extensively used and versatile mate becomes evident —the lectern, podium or multifunction stand.^{1,2}

Performers often turn to adjustable, portable and lightweight stands that function as podiums during their performances.¹¹ The design of these stands is important, focusing to be both adaptable and ergonomic, ensuring long duration of use without causing discomfort.¹⁰ Such

considerations play a pivotal role in nurturing self-assurance and providing a designed base for orators to flaunt their proficiency.⁸

However, setbacks come to light with regular podium stands, ranging from structural constraints to hurdles of weight and portability. To address these concerns, a novel approach has been taken in the design of a multifunctional stand, merging ergonomic principles to create an adjustable, lightweight, and highly functional equipment.² This innovative stand also provides a solution to the logistical challenges presented by conventional podium structures.⁴ Its adaptability and ease of conversion into a compact, cylindrical shape make it a convenient and portable companion deliver impactful presentations without compromise.

The innovation integrated in this multifunctional stand goes beyond superficial modifications, delving into the realms

of flexibility and portability.⁶ The stand's ergonomic design ensures that it effortlessly adjusts the varied requirements of its users, providing a comfortable and encouraging platform for prolonged use. Furthermore, the stand's remarkable ability to convert into a compact, cylindrical shape addresses the everlasting challenge of portability, offering a convenient solution for those who aspire to deliver impactful performances without compromise.

As this research progresses, commence on a journey to explore the conceptualization, design intricacies, and multifaceted benefits of this revolutionary multifunction stand. Through a comprehensive analysis of its ergonomic foundations and the seamless integration of form and function, explore to illuminate the revolutionary capability that this multifunctional stand brings to the forefront of public speaking and musical performances.¹⁰

Brief Description

The multifunction stand, an exceptional feat of design innovation, showcases a multitude of meticulously crafted features to cater to the diverse needs of artist, orators, musicians, and presenters. Comprising several integral components, each serving a specific purpose, this versatile apparatus surpasses traditional anticipations, providing a comprehensive resolution to the challenges posed by traditional podiums and stands.

Supporting Rod

The supporting rod, an essential component of the multifunction stand, is seamlessly attached to the stand top. Its primary purpose is to provide sturdy support to various items such as books, notes, tabs or laptops.⁹ In the domain of public speaking and musical performances, this component plays a pivotal role in ensuring that essential tools remain securely in place, allowing the presenter or musician to focus on their delivery without worrying about items slipping or falling.⁵

Stand Top

The stand top serves as the foundational platform base, providing adjustable height and angle support. This adaptability is critical in offering to the ergonomic needs of users, whether they are delivering a speech or playing a musical instrument. As highlighted in the introduction, musicians and orators alike require a platform that can be customized to their specific preferences, enhancing their comfort and performance.¹⁰

Stand Edge Blocker

The stand edge blocker, made up of rubber for improved grip, is designed to prevent laptops or books from unintentional falls.⁹ In the context of public speaking, this feature addresses the logistical challenges faced by speakers who may need to reference notes or use electronic devices

during their performance. The safety grip ensures a smooth and uninterrupted delivery.⁵

Ergonomic Handle

The ergonomic handle arises as a dynamic component, enabling adjustable mechanisms for the stand top. Its flexibility allows for both vertical and angular adjustments, accommodating the user's preferences. This feature aligns with the central focus of the abstract on ergonomic design, ensuring that orator can adapt the stand to their preferred positions, minimizing fatigue during extended performances.^{1,10}

360 Rotation Screw

The 360-rotation screw introduces a level of uncommon flexibility in traditional stands. Its features that empower the rotation of the stand top without the base movement, providing a unique advantage. In the context of musical performances, this feature facilitates smooth shifts between different angles, contributing to an aesthetically captivating and dynamic presentation.

Stationary Holders

The inclusion of two stationary holders meets practical necessities of users, offering designated spaces for pens, brushes, pencils, or even electronic gadgets. In line with the multifunctional essence of the stand, these holders ensure that essential tools are easily accessible, contributing to the efficiency and professionalism of artists, speakers and musicians.⁴

Lever for Leg Adjustment

The lever for leg adjustment, resembling of the slider mechanism in an umbrella, provides stability through the movement of three adjustable legs within the cylinder. This innovative approach to leg adjustment aligns with the abstract's emphasis on ergonomic concepts, offering a stable foundation while allowing for flexibility in height.⁶

Adjustable Legs

The three adjustable legs, an essential part of the stand's structure, contribute to both balance and height. As discussed in the introduction, traditional podiums often face challenges related to structural limitations, and the incorporation of adjustable legs in this multifunctional stand addresses these issues, ensuring adaptability to various environments and stages.¹

Hidden Transparent Space

The hidden transparent space at the stand top adds an element of discreet functionality. Its purposeful design allows users to store small items such as short notes, timetables, or personal items like images. This aligns with the overarching theme of adaptability and convenience, providing users with a discreet yet accessible storage option.

The multifunction stand stands as evidence to thoughtful design, effortlessly blending multiple features to address the specific needs of orators, artists and musicians across diverse domains. From ergonomic considerations to innovative storage solutions, each component contributes to the stand's revolutionary capability in enhancing the landscape of public speaking, artistic work and musical performances as shown in Figure 1.

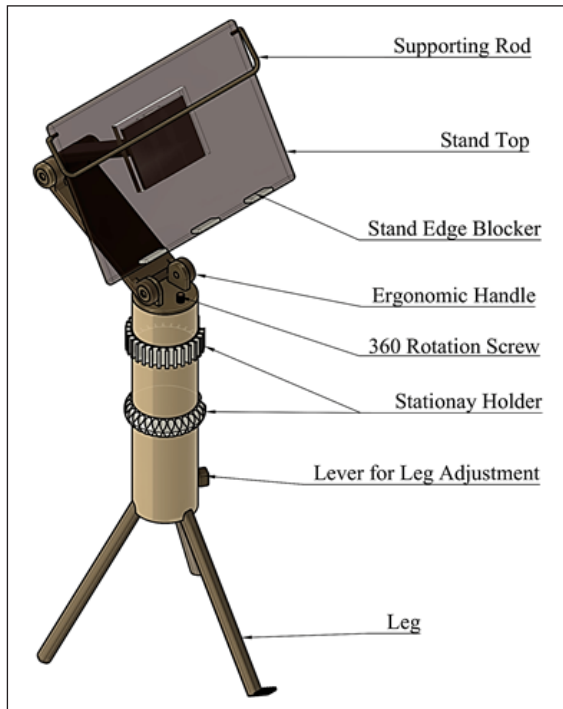


Figure 1. Project set-up

Ideation

The ideation phase of the multifunction stand represents a vigorous and detailed procedure that aimed to revolutionize the design of stage equipment, specifically addressing the challenges faced by artists, orators and musicians. Beginning with the identification of challenges, the research work initiated on a thorough examination of the limitations inherent in traditional podiums and stands as shown in Figure 2.¹

Aspiring to promote innovation, the ideation adopted a comprehensive approach that procured inspiration from diverse domains beyond the domain of conventional stage equipment.² By exploring concepts from ergonomic furniture design, engineering principles, and even everyday objects renowned for their adaptability, the work aimed to break away from preconceived notions and envision a truly transformative platform.^{8,10}

Brainstorming sessions emerged as a pivotal aspect of the ideation process, providing a platform for collaborative creativity. This exchange of ideas facilitated an abundant wellspring of concepts to draw upon for the subsequent

stages of the design process. The ideation process also incorporated an iterative prototyping approach to visualize and refine various design concepts.⁷



Figure 2. Example of some traditional podium stand

The integration of innovative features into the multifunction stand was a prompt outcome of insights obtained during the ideation phase. With the ideation phase completed, the implementation phase seamlessly followed suit. The research took the refined design concepts thoughtfully analyzing material selection, structural integrity, and overall user experience.

Essentially, the ideation process of the multifunction stand

was an in-depth exploration that accepted challenges, pursued inspiration from diverse sources, nurtured creativity through collaboration, and translated ideas into tangible solutions. The multifunction stand stands as a tangible outcome of a design process that prioritized user needs, innovation, and adaptability, redefining the landscape of public speaking and musical performances as shown in Figure 3.

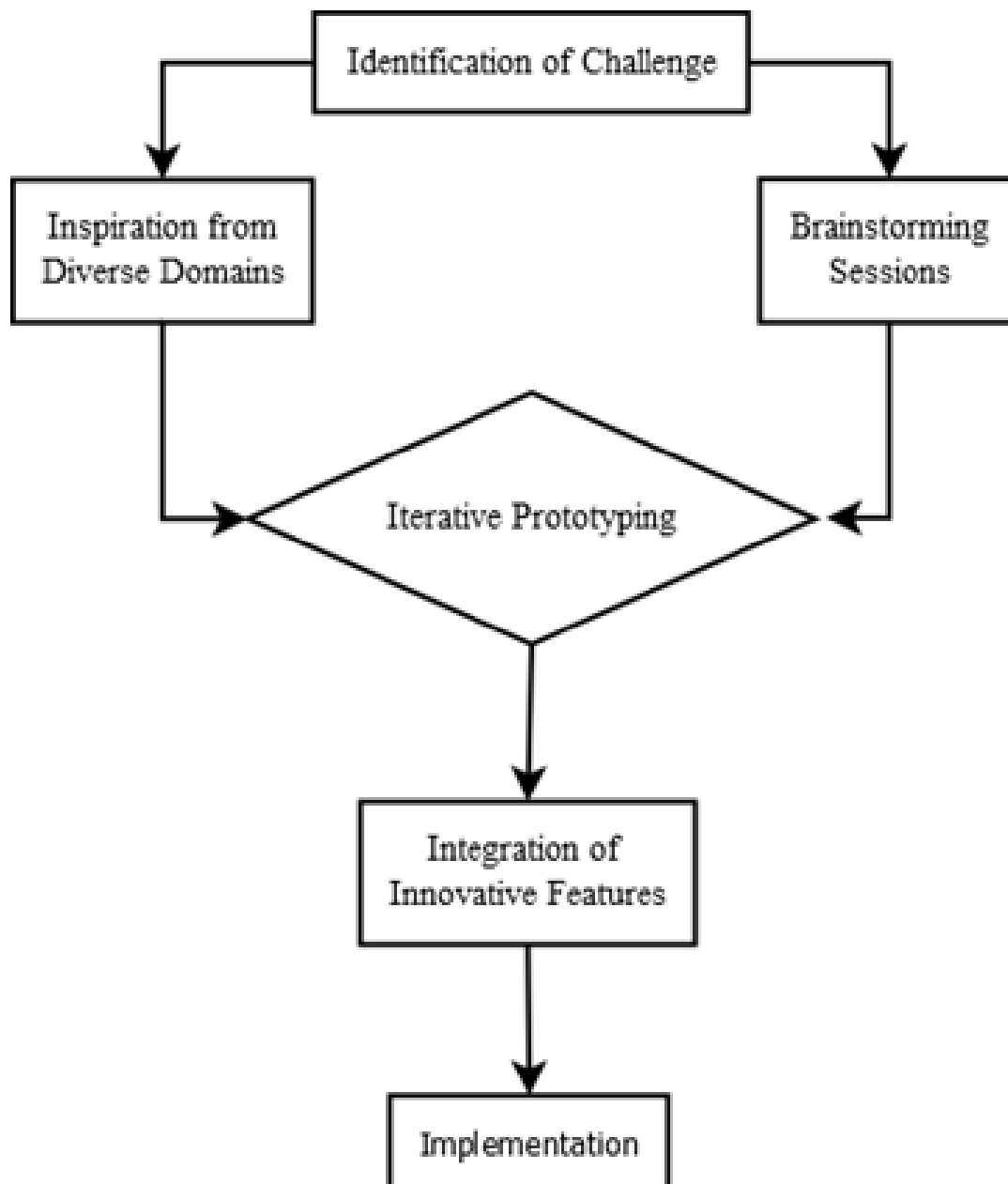


Figure 3. Ideation process flowchart

Drawing and Design Description

The execution of an ideal multifunction stand begins with the beginning of its conceptual sketch, where the delicacies of merging all essential features into a unified design are visualized. This conceptual sketch serves as the bridge between abstract ideas and a tangible product, transforming mental concepts into a visual representation of the multifunction stand. The dotted lines within the conceptual design denote the internal components, providing a complete insight of the stand's interior as shown in Figure 4.

The next crucial step in the design process involves transforming from the conceptual sketch to a three-dimensional (3D) model, bringing the envisioned multifunction stand to life. Autodesk Fusion 360, a high-tech computer-aided design and computer-aided manufacturing (CAD/CAM) software, plays a pivotal role in this transformation. Through this methodical design process, the multifunction stand expands from an early idea to a tangible presentation, ensuring that every element is carefully considered and integrated. The use of advanced design software enables a detailed examination of the stand's structure, components, and functionality.³

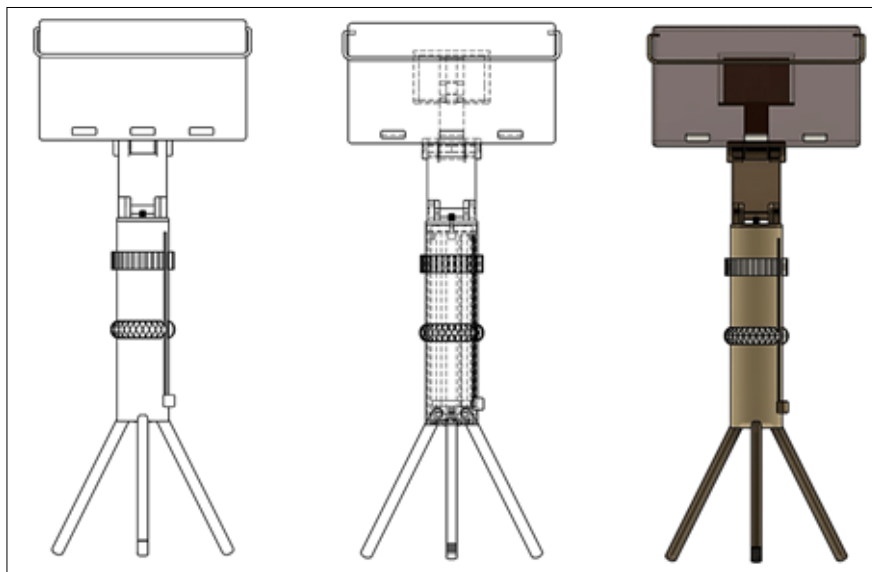


Figure 4. Iteration process of sketch to design implementation

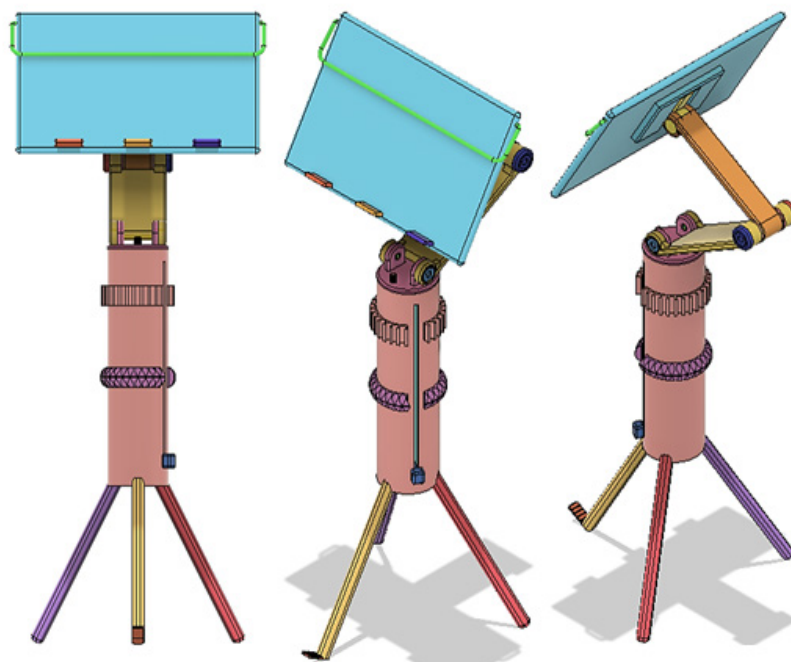


Figure 5. Final 3D model made on Autodesk Fusion 360

Result and Discussion

In the result and discussion section, the summit of the multifunctional stand's design journey is evident in the finalized CAD model. The intricately designed parts, depicted through distinct color coding, showcase the detailed transposition of the conceptual sketch into a detailed representation. The use of Autodesk Fusion 360 highlights the advanced design process, ensuring precision and comprehensive visualization. This CAD model stands as a visible realization, setting the stage for further discussions on the innovative features, structural considerations, and overall efficacy of the multifunction stand in catering to diverse necessities of orators, artists and musicians as shown in Figure 5.

The multifunction stand's design attains in dimensions modeled for adjustable functionality and ergonomic excellence. With an adjustable height of 1550 mm, the stand meets assorted user preferences, ensuring optimal positioning for artists, orators and musicians. During transportation, its ability to convert into a compact 600 mm cylinder reflects a pragmatic ergonomic concept, putting emphasis on ease of movement without compromising functionality as shown in Figure 6.

Central to its ergonomic design is the stand top, featuring a broad platform measuring 350 mm in breadth and 600 mm in length. This ergonomic layout prioritizes user comfort

and functionality, providing a versatile space suitable for various tasks such as holding notes or supporting laptops. The comprehensive assessment of ergonomic principles in the final dimensions makes the multifunction stand a necessary equipment, offering adaptability across different domains and enhancing the overall user experience in public speaking and musical performances.

The conclusion of the multifunction stand design is integrated in the thorough Fusion-generated table of part lists, revealing a detailed analysis of its elaborate components. The attached table illustrates a total of 33 components, each precisely named and accompanied by its corresponding mass based on the selected material. The thoughtful selection of materials for each component ensures not only structural integrity but also functional efficiency, aligning with the multifunction stand's versatile nature as shown in Figure 7.

At the key element of this structure is the base_link, serving as the main body part that binds and intertwines all components through the software's joint functions. The table provides a detailed insight into the composition of the multifunction stand, offering transparency regarding the mass distribution and material specifications for each component. This level of detail is crucial for understanding the stand's overall weight distribution, structural robustness, and the importance of material choices on its performance.

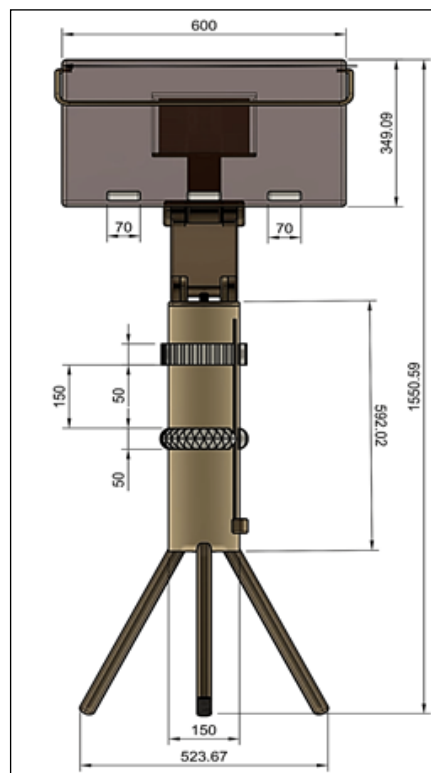


Figure 6. Dimensions of multifunction stand

Parts List					Parts List				
Item	Qty	Part Name	Material	Mass	Item	Qty	Part Name	Material	Mass
1	1	Base_link	Plastic	1.70 kg	18	1	Handle_base	Aluminum	2.80 kg
2	1	Front_leg	Wood	0.22 kg	19	1	Handle_base_left_bearing	Steel	0.21 kg
3	1	Base	Steel	31.87 kg	20	1	Handle_base_right_bearing	Steel	0.21 kg
4	1	Front_leg_rod	Steel	0.00 kg	21	1	Handle	Aluminum	1.92 kg
5	1	Front_leg_spring	Steel	0.03 kg	22	1	Handle_left_bearing	Steel	0.48 kg
6	1	Lever	Aluminum	0.68 kg	23	1	Handle_right_bearing	Steel	0.48 kg
7	1	Left_leg	Wood	0.22 kg	24	1	Handle_right_bearing_plate	Steel	0.06 kg
8	1	Right_leg	Wood	0.22 kg	25	1	Handle_left_bearing_plate	Steel	0.06 kg
9	1	Left_leg_rod	Steel	0.00 kg	26	1	Top_platform_base	Aluminum	1.23 kg
10	1	Right_leg_rod	Steel	0.00 kg	27	1	Top_platform	Epoxy Resin	5.75 kg
11	1	Left_seg_spring	Steel	0.03 kg	28	1	Supporting rod	Aluminum	0.18 kg
12	1	Right_leg_spring	Steel	0.03 kg	29	1	Mid_edge_blocker	Rubber	0.02 kg
13	1	Paddle	Plastic	0.01 kg	30	1	Left_edge_blocker	Rubber	0.02 kg
14	1	Bearing_plate	Steel	0.59 kg	31	1	Right_edge_blocker	Rubber	0.02 kg
15	1	Top_bearing	Steel	0.86 kg	32	1	Bottom_holder	Rubber, Silicone	0.17 kg
16	1	Rotation_base	Steel	3.58 kg	33	1	Top_holder	Rubber, Silicone	0.18 kg
17	1	Rotation screw	Steel	0.04 kg					

Figure 7. Parts list of multifunction stand with selected material and its mass

The research results, as evidenced by the detailed part list and material specifications, underscore the comprehensive strategy taken in the multifunction stand’s design. The fusion of ergonomic considerations, material science, and engineering principles has resulted in a final product that extends beyond basic use. This versatile approach ensures that the final product not only meets but exceeds the expectations set forth during the conceptualization and design phases, setting the multifunction stand as a remarkable achievement in the realm of versatile and ergonomic equipment for artists and orators.

Conclusion

- Multifunction stands merges ergonomic design, material science, and engineering principles for a versatile and efficient professional tool.
- Comprehensive part list aids manufacturing processes with precise material and mass details, ensuring sustainability and efficiency.
- Practical implications of material choices underscore sustainability and efficiency in manufacturing processes.
- The multifunction stand stands as a testament to the successful fusion of creativity, precision, and practicality, elevating professionalism for artists and orators.
- The conceptualization-to-realization journey highlights adaptability, emphasizing optimal user experience.
- The multifunction stand transcends functionality, embodying a holistic approach that sets new standards for ergonomic equipment in professional settings.

Acknowledgements

Funding: The present work has received no funds in any manner from any organization.

Conflicts of interest: The authors declare that they have no involvement in any organization or entity with any financial interest.

References

1. Canales, T., Day, S., Sigley, D., & Sippel, S. (2016). Inclusive Lectern.
2. Back, M., Lertsithichai, S., Chiu, P., Boreczky, J., Foote, J., Kimber, D., ... & Matsumoto, T. (2009). Rethinking the Podium: A Rich Media Control Station for Next Generation Conference Rooms. Interactive Artifacts and Furniture Supporting Collaborative Work and Learning, 1-14.
3. Mahto, H. K., Pandey, N., Mahalik, V., Shrivastava, A., Pandey, A., Tewari, P., ... & Gupta, P. DESIGN AND ANALYSIS OF THE COMPONENT OF GLASS CLEANING ROBOT USING GENERATIVE DESIGNING MODULE.
4. Back, M., Lertsithichai, S., Chiu, P., Foote, J., Kimber, D., Boreczky, J., ... & Matsumoto, T. (2005). The convertible podium: a rich media teaching tool for next-generation classrooms. In ACM SIGGRAPH 2005 Educators program (pp. 21-es).
5. Griffis, M. R. (2018). Where the users are: reconsidering information provision through roving models of service. Challenging the “Jacks of All Trades but Masters of None” Librarian Syndrome, 39, 35-65.
6. American Library Association. (2011). Building Blocks for Planning Functional Library Space. Scarecrow Press.

7. Hausendorf, H., & Schmitt, R. (2022). 14. Architecture-for-interaction: Built, designed and furnished space for communicative purposes. In *Pragmatics of Space* (pp. 431-472). De Gruyter Mouton Berlin, Boston.
8. Riley, P. C., & Gallo, L. C. Ormond Beach, FL.
9. Desks, P. G., Guide, M. K., Keyboards, G. M., Keyboards, B. M., Keyboards, R. M., Backlight, B. M., ... & Earbuds, G. Roll Around Computer Desks.
10. Mancini, M. (2022). Design for the Music Industry: When the Gap is an Opportunity Scenario Analysis, Trends in Contemporary Research, Case Study of a New Product. *Diid Disegno Industriale Industrial Design*, (77).
11. Smardzewski, J. (2015). *Furniture design* (Vol. 6, pp. 226-249). Berlin/Heidelberg, Germany: Springer.