

# Expandable Umbrella Using Design Thinking Approach

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## Abstract:

In a world where the weather can change drastically from sunny to rainy in an instant, the conventional umbrella has been a reliable companion for a very long time. In response to these difficulties, the innovative Expandable Umbrella Project was born, aiming to transform traditional umbrella design. With its dynamic mechanism that makes it easy to adjust its size, the expandable umbrella offers both individuals and groups a versatile place to shelter. Its very construction is engineered to be reliable, durable, and strong, making it resistant to the weather.

The project's core value is the user experience. The umbrella offers a useful solution for any situation and blends in seamlessly with users' lives thanks to its easy-to-use controls and optional expansion feature. This flexibility not only improves use but also solves a lot of the common problems with regular umbrellas. The expandable umbrella is a customized solution that was developed after a thorough analysis of the needs and challenges of its users. It is not just a product. The common umbrella serves as a recognizable representation of shelter from the weather in a world where weather fluctuations are a constant source of difficulty.

**Keyword:** Expandable Umbrella, Easy to control, Customized the top of the umbrella.

## I. INTRODUCTION

The common umbrella serves as a recognizable representation of shelter from the weather in a world where weather fluctuations are a constant source of difficulty. Nonetheless, it becomes clear that a new design paradigm is required because rain showers and strong winds frequently push the limits of traditional umbrellas.

The Expandable Umbrella Project originated from this, an ambitious project aimed at redefining the fundamental purpose of an umbrella. With the goal of creating an umbrella that surpasses the limitations of its predecessors, this project sets out on an innovative journey. This umbrella guarantees longevity and a smooth and easy-to-use experience by utilizing state-of-the-art materials and engineering. People find this umbrella to be very helpful.

However, this expandable umbrella project goes beyond just being useful. The expandable umbrella complies with contemporary environmental requirements while simultaneously providing rain protection. In contrast to conventional long umbrellas, one can carry these items discreetly and use them only when necessary. With these umbrellas, you're always prepared for rain, sunshine, and strong winds. This umbrella guarantees longevity and a smooth and easy-to-use experience by utilizing state-of-the-art

materials and engineering. People find this umbrella to be very helpful.

## II. LITERATURE REVIEW

[1] A technique for creating origami art that has many engineering applications was developed by Maria Savchenk and Ichiro Hagiwara. The source of the desired system characteristics is folding structures, as numerous studies have demonstrated. This paper examines the optical and mechanical properties of a beach umbrella designed using the principles of origami. Reduce the negative effects of solar radiation on human health, make the model compact for storage, and ensure that it does not collapse in the wind are the main requirements for the designed model. By simulating the propagation of light rays through the designed paper origami-based structure using the developed recursive ray tracing algorithm and carrying out numerical simulations, the optical and mechanical properties of the designed model are highlighted. A combination of ray tracing approach and an optimization technique based on the genetic algorithm for modifying the developed model is also discussed. Simulation results are presented in the illustrations. This paper examines the optical and mechanical properties of a beach umbrella designed using the principles of origami.

[2] Robert W. Patten created the umbrella hat, which features a standard umbrella canopy supported by ribs made of cloth or plastic. To maintain the canopy over the head, four small shafts on each rib are used to attach it to a headband. Generally speaking, the canopy can be folded up, much like an umbrella, with the ribs and fabric collapsing around the headband shafts. A vast variety of colours and sizes are available for umbrella hats, including those featuring national flags like the US Flag, the nation that gave rise to the design. He said that while prospecting in Mexico, he came up with the idea for the umbrella hat. A vast variety of colours and sizes are available for umbrella hats, including those featuring national flags like the US Flag, the nation that gave rise to the design.

He said that while prospecting in Mexico, he came up with the idea for the umbrella hat. A mosquito net that was fastened to the canopy of his original hat was also included. In the 1890s, Patten relocated to Seattle and earned the nickname "Umbrella Man." After that, he worked as an umbrella repairman and served as the inspiration for a cartoon by John Hager that featured Robert Patten wearing an umbrella hat. Hager's caricatures of Patten were humorous and depicted him as eccentric. The "brockabrella," a red and white variation of the hat endorsed by American baseball Hall of Famer Lou Brock, was marketed by actor Billy Crumbaugh's father. It helped the gadget gain some notoriety in St. Louis during the middle of the 20th century. The umbrella hat has come a long way since then. It's frequently connected.

[3] The fan umbrella idea was put forth by Philip C. Apple. A pole, an upper hub, main umbrella support members, a lower hub, lower umbrella support arms, and a main umbrella fabric cover attached to the main umbrella support members comprise the umbrella fan provided by the present invention. Attached to the main umbrella fabric cover, at least one fan member is dependent upon it downward. In order to rotate the main umbrella support members, the lower hub, the lower support arms, the main umbrella fabric cover, and at least one fan member in relation to the pole, a motor attached to the pole must be operably connected to at least one of the upper and lower hubs. As a result, a pole, an upper hub, main umbrella support members, a lower hub, lower umbrella support arms, and a main umbrella fabric cover attached to the main umbrella support members comprise the umbrella fan provided by the present invention. In order to rotate the main umbrella support members, the lower hub, the lower support arms,

the main umbrella fabric cover, and at least one fan member in relation to the pole, a motor attached to the pole must be operably connected to at least one of the upper and lower hubs. As a result, a pole, an upper hub, main umbrella support members, a lower hub, lower umbrella support a plurality of lower umbrella Support arms, a pole, an upper hub; a fabric cover attached to Said main umbrella Support members; at least one fan member attached to Said main umbrella fabric cover and depending downwardly from Said main umbrella fabric cover; and drive means mounted to Said pole operably connected to Said one of Said upper hub and Said lower hub and adapted to rotate Said upper hub, Said main umbrella Support members, Said lower hub, Said lower umbrella Support arms, Said main umbrella fabric cover, and Said at least one fan member relative to Said pole, whereby Said at least one fan member directs a flow of air downwardly when Said drive means is in a downward position.

[4] Sandeep G. Rathod, a professor, suggested One marketing strategy that uses a single brand name to sell two or more related goods or services is umbrella branding, also referred to as family branding. Typically, businesses that have positive brand equity—that is, a brand's value in a particular marketplace—use umbrella branding. Every product uses the same naming conventions and doesn't have any additional brand names or symbols. Umbrella branding is a marketing strategy distinct from brand extension since it promotes similar products under a single brand name as opposed to products with unique features. Using umbrella branding does not prevent a business from the Umbrella branding is a marketing strategy distinct from brand extension since it promotes similar products under a single brand name as opposed to products with unique features One marketing strategy that uses a single brand name to sell two or more related goods or services is umbrella branding. Umbrella branding is a marketing strategy distinct from brand extension since it promotes similar products under a single brand name as opposed to products with unique features. Every product uses the same naming conventions and doesn't have any additional brand names or symbols. to specific product lines by grouping them together under a single brand name, improving their marketability by making them easier to recognize. A company's master brand, which provides structure and credibility to its other products, ensures that all of its products fall under a common umbrella of uniform quality and user experience. For example, all products bearing the parent brand name must meet the same high standards of quality.

[5] Hyun Kang and Geun Joo Choi created A new methodological technique called the umbrella review (UR) was developed to deal with the growing amount of published systematic reviews. In this study, we looked at the goals and principles of URs, their applicability in clinical settings, and the reasoning behind them. We also talked about the current issues in this area and gave a brief evaluation of the UR procedure. Integrating, assessing, and synthesizing the results of relevant systematic reviews is done through URs. URs can facilitate evidence-based decision-making and provide a broad perspective for the resolution of healthcare issues by summarizing the evidence and offering guidance on a range of interventions that are appropriate for specific conditions in a broad field. we looked at the goals and principles of URs, their applicability in clinical settings, and the reasoning behind them. We also talked about the current issues in this area and gave a brief evaluation of the UR procedure. Integrating, assessing, and synthesizing the results of relevant systematic reviews is done through URs. URs can facilitate evidence-based decision-making and provide a broad perspective for the resolution of healthcare issues by summarizing the evidence and offering guidance on a range of interventions that are appropriate for specific conditions in a broad field. Integrating, assessing, and synthesizing the results of relevant

systematic reviews is done through URs. URs can facilitate evidence-based decision-making and provide a broad perspective for the resolution of healthcare issues by summarizing the evidence and offering guidance on a range of interventions that are appropriate for specific conditions in a broad field.

[6] Christine Siemer and Michael Gessler suggested Review studies are necessary for systematic knowledge aggregation, clarification, and interpretation because of the exponential rise in articles with a vocational focus that has resulted from the public's growing interest in vocational education and training (VET), especially since the economic crisis of 2007–2008. Review studies are assumed to adhere to the same minimal requirements as other research methods: the review needs to be at least repeatable, and this means that the findings need to be verifiable or falsifiable. However, no research has been done on the review techniques used in VET research up to this point. Reviewing the processes and techniques employed in published reviews of VET research is our goal in order to assess the methodological quality of those reviews as of right now. Review studies are assumed to adhere to the same minimal requirements as other research methods: the review needs to be at least repeatable, and this means that the findings need to be verifiable or falsifiable.

[7] The Umbrella action research project was created by Tracy Muir, Susan Salter, David Kember, and Tracy Anne Douglas as a means of improving learning and teaching quality. It unites several smaller action research projects under a single organizational and thematic heading. An example of an overarching action research project with the goal of improving teaching quality is given in this article. The first of these comes from the enhancements made to the small projects that instructors typically lead for the classes they instruct. The project team's collective reflective discussions serve as the second mechanism. Participants can change how they understand the shared theme issue collectively by using the collective umbrella that spans the individual projects. Therefore, there's a chance for an emancipatory shift to occur, where the total accomplishes more than the sum of the individual endeavours. This article provides case studies from an project. Participants can change how they understand the shared theme issue collectively by using the collective umbrella that spans the individual projects.

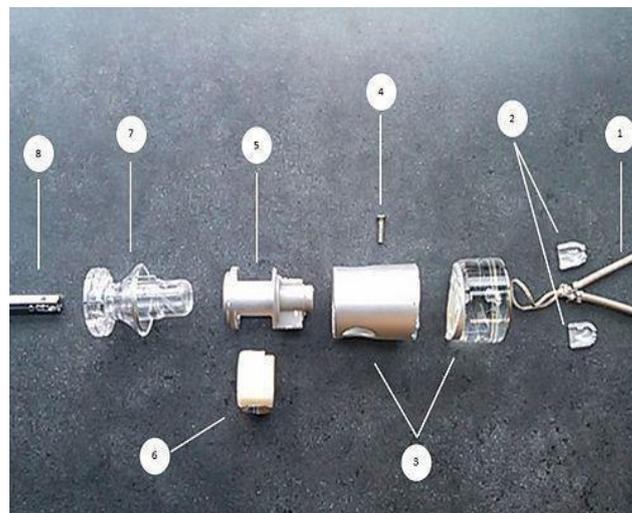
This article provides case studies from an overall online learning project to support the impact of umbrella action research projects. The cases serve as a showcase for our thoughtful conversations about encouraging student participation in online learning. They demonstrate how our understanding of how students engage in online learning has advanced and some strategies that have been tried in small projects to boost student engagement. We explore the possibility of shifting some of the resources currently allocated to quality assurance to quality enhancement by supporting action research projects, since there is evidence of teaching quality enhancement through the umbrella action research project. Participants can change how they understand the shared theme issue collectively by using the collective umbrella that spans the individual projects. This article provides case studies from an overall online learning project to support the impact of umbrella action research projects. The cases serve as a showcase for our thoughtful conversations about encouraging student participation in online learning. They demonstrate how our understanding of how students engage in online learning has progressed and some strategies that have been tried in small projects to boost student engagement. Participants can change how they understand the shared theme issue collectively by using the collective umbrella that spans the individual projects. This article provides case studies from an overall online learning project to support the impact of umbrella action

research projects. An umbrella action research project with the goal of improving quality is given in this article. This article provides case studies from an overall online learning project to support the impact of umbrella action research projects. We explore the possibility of shifting some of the resources currently allocated to quality assurance to quality enhancement by supporting action research projects, since there is evidence of teaching quality enhancement through the umbrella action research project. Participants can change how they understand the shared theme issue collectively by using the collective umbrella that spans the individual projects.

### III. METHODOLOGY

The umbrella folds down smoothly into a more compact size when not in use thanks to its folding structure, which is separated into three sections and joined by hinges. The expandable umbrella is made to be as portable and user-friendly as possible. When not in use, the umbrella's structure may be folded into a small, portable size thanks to its three pieces being joined by hinges. By acting as pivot points, these hinges make it easier to fold and unfold objects smoothly.

The umbrella's telescoping shaft, which retracts into itself to enhance its overall mobility, complements this design. The frame- attached cloth canopy is intended to fold smoothly with the collapsible structure. The opening mechanism is simple to operate, whether it is automatic or manual. Automatic models often have a button that activates a spring-loaded mechanism for rapid deployment.



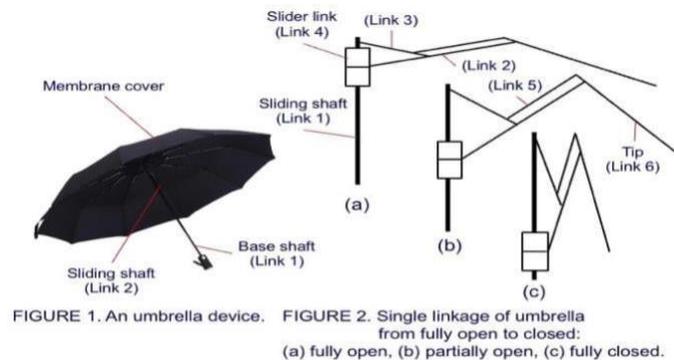
**Fig 1: Basic Materials**

Usually, you have to manually close the umbrella by pressing the pieces together or by pressing a release button. When folded up, the three-fold umbrella is small and lightweight, making it a popular option for anyone looking for a portable solution for erratic weather while they're On the go. The frame- attached cloth canopy is intended to fold smoothly with the collapsible structure.

A crucial structural element, the frame is often made of strong, lightweight materials like steel or aluminium. It's also possible to add fibre glass ribs for flexibility and durability. Depending on the size and design of the umbrella, the shaft that connects the handle to the canopy is commonly made of steel for strength or aluminium for resistance to corrosion.

Important components of the folding mechanism, like hinges and joints, can be made of sturdy metals like

steel, aluminium, or durable polymers. The canopy, which is crucial for weather protection, usually consists of fabrics like nylon or polyester, which are renowned for their durability and water resistance.



**Fig 2: fully open, partially open, fully closed**



**Fig 3: Expandable Model**

The locking mechanism that keeps the umbrella closed might be made of sturdy metal or plastic. Because of the meticulous material selection, expandable umbrellas are not only lightweight and portable but also weather-resistant. It's also possible to add fibre glass ribs for flexibility and durability.

#### IV. 5 STAGES OF DESIGN THINKING

##### STAGE - 1: EMPATHIZE

We understood the concerns parents had about the expandable umbrella at this point very well. We gathered information about their feelings, anxieties, and day-to-day struggles associated with this umbrella through research, surveys, and interviews. To gain an understanding of the particular challenges they encountered in protecting their kids from rain and other hazards, we fully immersed ourselves in their experiences.

##### STAGE - 2: DEFINE

It is possible to define the problem statement from the empathy stage. "Issue Synopsis It is apparent that a large number of people require an umbrella that can hold more than three people comfortably. Particularly for families with kids and outdoor enthusiasts, the current generation of standard umbrellas is inadequate for offering a roomy and practical shelter experience. In order to solve these problems and provide a practical solution for dependable weather protection, our goal is to create an expandable umbrella."

### **STAGE – 3: IDEATE**

Our team investigated a number of ideas for the problem statement defined in the Define stage, all of which attempted to solve the stated issue of comfortably housing more than three people under the umbrella. An integration of modular canopy sections was suggested as a solution, enabling users to adjust the size to suit their own requirements. The Expandable Umbrella offers a thorough and creative fix. As we proceed with prototyping and testing, these concepts serve as the initial creative spark that will direct us. And we have planned so idea to do it . In the Ideate stage, creativity was allowed to run wild in a cooperative setting. Every team member contributed their distinct viewpoints and concepts to the group. We embraced unconventional methods and thought outside the box in an effort to deviate from conventional umbrella designs.

Expandable inflatable extensions inside the canopy that were easily inflated and deflated was another idea. Furthermore, consideration was given to a telescopic framework that could extend to increase the coverage area and provide ample space for multiple users.

Our investigation also included folding canopy panels that expand to cover a larger surface area in the shade. It was suggested to use collapsible handles to maximize portability without compromising comfort. During the prototyping and testing process, these concepts act as the first creative spark that will guide us. By including detachable canopy sections, the umbrella's design allows users to customize its size to fit their needs. Incorporate flexible elements into the canopy to generate an extensible feature that is easy to extend and compress.

### **STAGE – 4: PROTOTYPE**

We develop a low-fidelity prototype of the expandable umbrella idea during the prototype phase. This umbrella guarantees the safety of your children, especially in the case of bad weather or rain. Users will be protected from the heavy downpour by it.

The first prototype focuses on modular canopy sections with an interchangeable canopy segment system and a frame made of lightweight and durable materials. Users ought to be able to modify the umbrella's size to meet their own needs thanks to this design. The second prototype incorporates inflatable extensions into the canopy and is composed of high-quality, puncture-resistant materials. There is an expandable component to this inflatable feature. The purpose of this design is to provide a spacious shelter experience with an easy-to-use extension mechanism. The fourth prototype looks into foldable canopy panels, with panels that expand outward made of flexible yet sturdy materials. We can select and refine the ideal design for the final product with the aid of this. Every prototype will undergo a thorough testing process to assess its functionality, usability.

Users can extend and retract the umbrella's coverage area with the third prototype's telescopic framework, which is composed of lightweight yet durable materials. A roomy shelter experience with an easy-to-use extension mechanism is the goal of this design. Using flexible yet durable materials for the panels that expand outward, the fourth prototype investigates foldable canopy panels. Using a dependable collapsing mechanism and strong materials, the fifth prototype features handles that fold down.



To evaluate functionality, usability, and durability, each prototype will go through a rigorous testing process. This will help us fine-tune and choose the best design for the finished product.

### STAGE-5: TEST

For the undertaking We invited users to use them and let us know what worked and what didn't. We made sure they remained sturdy and were simple to assemble. In order to see if they grew larger and remained stable, we also inflated them. We ensured that the ones with height and length adjustment features were robust and user-friendly, even at large sizes. We opened and closed the ones with folding parts to check the level of coverage. We also tested the ease of handling and carrying the handles, which have the potential to get small. This assisted us in selecting the best umbrella concept.

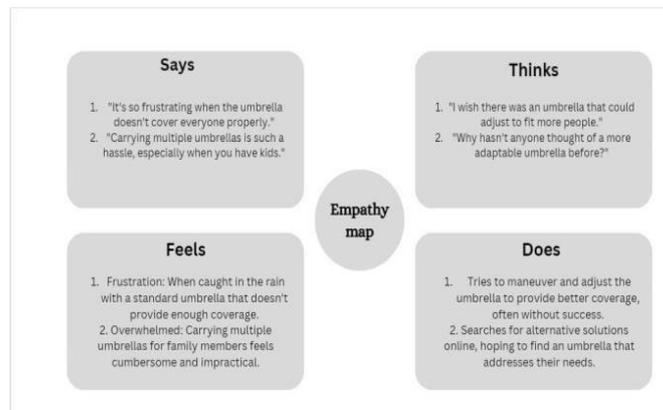


Fig 4: Empathy Map



Fig 5: Journey Map



**Fig 6: Persona**

## V. CONCLUSION

The future of the expandable umbrella looks bright. Making an expandable umbrella that comfortably fits more people was our aim. We heard what people had to say and developed our own ideas. We put them to the test to determine which performed the best. We learned from this project that it's important to know what other people want. We discovered an effective solution by experimenting. In order to create even better designs in the future, it is crucial that we continue to test and listen.

## VI. FUTURE SCOPE

There are encouraging directions for the expanding umbrella project's future growth. Users may receive real-time updates through the integration of smart technologies, such as weather sensors. A more robust and weather-resistant design could result from research into cutting-edge materials. Acquiring intellectual property rights protects original inventions. Long-term success requires the ability to adjust to changing market trends and user preferences. In the future, expandable umbrellas will undoubtedly be very important.

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