

Designing an Ideal Desk

a inventing with TRIZ case study

People's posture affects their comfort and well-being, leading to musculo-skeletal problems, poor posture and injuries. Adjustable portable furniture could be all it takes to promote better health and increase individual's freedom and autonomy which, evidence suggests, could bring about an increase in overall quality of life, productivity, while reducing the dangers of our largely sedentary lifestyle.

The solution designed was a portable desk consisting of a frame-structure and a collapsible table top, ergonomically designed to enable a comfortable working posture anywhere. The versatile design also allows it to be converted from a counter weighted desk into a stand alone table by simply turning around the frame structure. This way, the user has the flexibility to use it as a sidetable or put on any other table to turn it into a standing desk as well depending on her needs. The solution developed was submitted for patent (WO2017126985A1) and, although the examiners feedback was extremelly positive, the patent was abandoned due to fees costs.



Figure 1 - portable desk

Key features of the portable desk are:

- Ergonomic: meets the heights of different users
- Portable: folds into an A4 folder and fits most bags and backpacks
- Engineered & Designed: carefully thought out to enhance the user experience and usability
- Sustainable: socially, environmentally and economically conscious
- Customisable & personalisable: tailored to each user.

How did we did it?

The portable desk's product development process started with the identification of the problem and the design of conceptual solutions, followed by an initial assessment of the viability and originality of the idea.

Since no similar solution was found, the team decided to define the detailed requirements and develop prototypes of the invention in order to test and patent the solution.

While the patent was being drafted, the team focused on refining the product's design to further meet user's needs and determine any additional requirements or constraints.

Once the patent was published, the team went through one more design iteration to adapt it to the manufacturing limitations and to the standard materials and components, so that it could be produced at a smaller cost.

The team used TRIZ tools, and several others, throughout the project to solve many of the contradictions and meets constraints to satisfy the different requirements of the design, specifically during the "Concept Design" phase and the "Design and Engineering Development" phase. The next few paragraphs will succinctly highlight the use of TRIZ in the design and development of the portable desk.

Concept Design phase:

With the initial identified market gap, the "Ideal Outcome & Ultimate Goal" tool was used to specify the ideal envisioned solution: a floating working surface. Following this, a "Resource list", consisting of super system, system and sub system, was drawn in order to make use of the resources in the environment. Through out the project a "Bad Solutions Park" was utilised and with the information from the "Ideal Outcome & Ultimate Goal" and the "Resource list" and the help of other creativity tools - biosociation, brainstorming, reframing, etc - the "Bad Solutions" board resulted in 50, or so, concepts.

Then, using the "Ideal Outcome & Ultimate Goal", a methodical downselection framework was used to select the concept that best solved the problems being tackled.

Design and Engineering Development phase:

Once the concept was chosen, it became a matter of developing it further. For this part of the process, TRIZ helped in simplifying the system and enhancing the benefits of the solution.



Figure 2 - an example of simplifying a system by Trimming

First the team used the "Trends of Evolution Scale" to increase the ideality of the portable desk. This was done by analysing the position of the conceptual technology along the scale, seeing where the solution could move closer to the ideal. Specific trends were further explored such as "Simplification through Trimming", the concept was dissected and all the unnecessary parts trimmed; as well as "Line Geometric Evolution", to streamline the folding-into-carrying-mode procedure; and finally "Actions Co-ordinations" to

make the experience of the user more objective and comprehensible.

Subsequently, since all requirements were not yet fulfilled, the team uncovered a number of contradictions and looked up the relevant using the "40 Inventive Principles" to generate new ideas and improvements to solve these contradictions: improving the "Weight of Stationary Object" without making "Volume of Stationary Object" worse; improving the "Volume of Stationary Object" without making "Strength" worse; and improving the "Weight of Stationary Object" without making "Strength" worse. This tool helped the team to think about the materials and the shape of the product, and to improve the interactions between user and product, thus enriching the user's experience. In particular, the Inventive Principle 9, one of the solutions to the Volume-Strength contradiction, suggest the idea of creating beforehand stresses in an object that will oppose known undesirable working stresses later on, which sparked the idea of using both compression and tension forces that annulate each other to have a bigger stable working surface.

All changes made during the "Design and Engineering Development" phase were evaluated by the team using the "Ideality Audit", so that the product's benefits were increased while its costs and harms reduced.

Conclusion

Using systematic methods and frameworks helped chart the process from an unmet need to a finished product, making the process fast, effective and innovative. TRIZ was used at every stage to:

- Articulate and define all needs
- Uncover all resources to help generate novel, elegant and innovative solutions
- Provide robust criteria to downselect and choose between ideas
- Develop and improve the product by uncovering and solving contradictions and applying the "Trends of Technical Evolution"
- Evaluate all solutions using the "Ideality Audit"