



Ideaforge



DIEF CST2104 GROUP 11

# Design Brief

Zhang Bairui

Liu Weixuan

Yu Zexiang

Wu Hao

Liu Ziqing

Wang Yilin

Desk Extender+



**SSTC**  
SYDNEY SMART TECHNOLOGY COLLEGE  
NORTH-EASTERN UNIVERSITY

# Content

<b>1. Executive summary .....</b>	<b>1</b>
<b>2. Introduction .....</b>	<b>2</b>
<b>3. Product Overview .....</b>	<b>2</b>
3.1 Problem Opportunity .....	2
3.2 Product Description .....	3
3.3 Innovative Features .....	3
3.4 Stakeholder Requirements .....	4
<b>4. Product Design Features .....</b>	<b>6</b>
4.1 Manufacture .....	6
4.2 Assembly .....	6
4.3 Maintainability .....	7
4.4 Safety .....	7
4.5 Sustainability .....	7
4.6 Usability .....	8
4.7 Design Optimization .....	8
<b>5. market potential .....</b>	<b>9</b>
5.1 Who is our market? .....	14
5.2 Existing products & competitors .....	14
5.3 Multifunctional table features .....	14
5.4 Potential Market .....	14
<b>6. Product business plan .....</b>	<b>14</b>
6.1 Cost and Budget .....	15
6.2 Revenue and Profit .....	15
<b>7. Conclusions and Recommendations .....</b>	<b>19</b>
<b>8. Reference .....</b>	<b>21</b>
<b>9. Appendices .....</b>	<b>22</b>

# 1. Executive summary

—Zhang Bairui 202119037

This report has been prepared for the management team of DIF.Co and focuses on Desk Extender+, a product developed by Group 11 specifically for university students in China. The device addresses common issues Chinese students face, including limited desktop space and an uncomfortable and inconvenient learning process. This comprehensive report systematically analyzes the product's design features, market potential, and business plan.

In 2022, the total number of college students in China was 19 million (Ministry of Education, 2018). The market for Desk Extender+ is expected to expand beyond students to include office workers in their workplaces or homes. The market opportunity for this product is significant due to its innovative and unique features, such as portability, safety, and affordability. These features have been carefully designed to meet the needs of stakeholders and fulfill product requirements.

The price for the Desk Extender+ has been set at \$64.89, taking into account a variable cost of \$50.29. Based on this pricing strategy, the break-even point will be achieved within ten months, with a sales volume of 7,072 units (Figure 1).

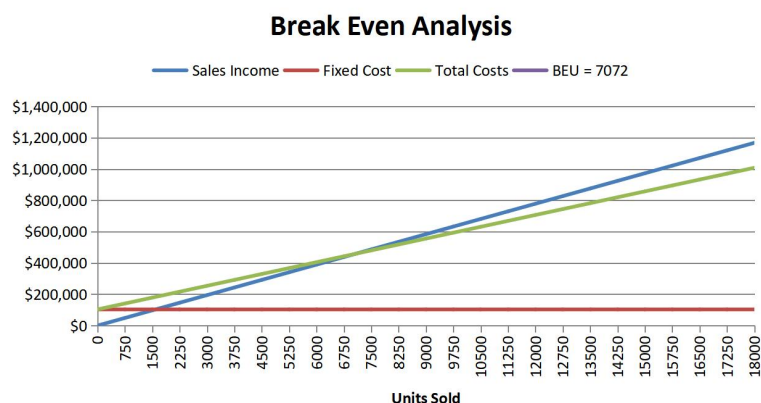


Figure 1. Break-Even Analysis

After conducting an in-depth analysis discussed in this report, it is highly recommended that the management of DIF.Co proceeds with the launch of the Desk Extender+, which will present DIF.Co with a valuable opportunity to enter the auxiliary device market, catering to a wide range of individuals seeking solutions of limited desk space.

## 2. Introduction

——Wang Yilin 202119047

This report outlines the product features and business plan for Desk Extender+ to evaluate its profitability and determine if it is a worthwhile investment for DIF.Co. The primary goal of this product is to address the challenges faced by students, deplorable study conditions resulting from small learning spaces, which can lead to uncomfortable and distraction. Using sturdy yet cost-effective materials, we aim to minimize variable costs and employ cost-plus pricing to make our innovative product competitive in the current market. This report will provide an overview of the innovative features of Desk Extender+ and their value proposition, analyze the market potential to identify the target demographic, evaluate the business plan to estimate the costs, and calculate the break-even point of 10 months.

## 3. Product Overview

——Zhang Bairui 202119037

### 3.1 Problem Opportunity

In recent years, students are increasingly reliant on various items like iPads, notebooks, and mobile phones on their desks. However, based on the findings from the questionnaire in Appendix A, 58.6% of students had previously met the difficulties of small desk space. Research conducted by Dorman (2014) has revealed that discomfort experienced during studying can lead to decreased concentration, emphasizing the urgent need to address these challenges. Additionally, Castellucci et al. (2017) have established a strong positive correlation between school furniture and students' learning efficiency. Considering these factors, we have developed the innovative Desk Extender+ to address the limitations associated with traditional desks, such as their restricted functionality and limited desk space capacity. Our team aims to significantly enhance the overall learning experience and improve students' learning efficiency by designing a multifunctional desk extender that can conveniently apply to their studies.

### 3.2 Product Description

The Desk Extender+ depicted in Figure 2 is a unique tool meticulously designed to overcome the limitations of limited desk space and single-function tables for students studying at school. It aims to create a comfortable and convenient learning environment for students. This innovative product comprises five essential components: two wooden boards measuring 30\*20\*0.95cm each, a flexible light fixture, an embedded 28.3\*18.6cm LCD blackboard, a wireless charging device, and a secure fixture. The specific dimensions of the product can be found in Appendix B.

The Desk Extender+ effortlessly clamps onto the desk's edges, effectively extending its surface area. It offers convenient disassembly and assembly of the two boards, making it highly portable and flexible. The left half of the table board features a bendable learning lamp, providing optimal illumination for students. Furthermore, the table board itself integrates an embedded LCD blackboard seamlessly. On the right half of the table board, a wireless charging device is incorporated, ensuring convenient access to power for students' learning devices.

Collectively, these features offering students comfort and convenience whether in school or anywhere they require a functional workspace.



Figure 2. 3D model of the product

### 3.3 Innovative Features

The multifunctional table extension boasts several distinctive features, contributing to its innovative design, as outlined in Appendix C:

**Detachable Design:** Unlike conventional expansion desks available in the market, our product offers a flexible detachable extender. Users can achieve various degrees



of desktop space expansion by removing the hinge connection between two boards while ensuring the desks' portability.

**LCD Blackboard:** Our desk extender+ incorporates an embedded LCD blackboard, setting it apart from traditional desk extenders. This feature enables students to record their inspirations and perform public calculations anytime. Eliminating the need for pen and paper avoids potential embarrassment and reduces paper waste, contributing to ecological conservation efforts.

**Bendable LED Light:** The expansion desk board includes a bendable LED study light that addresses the issue of insufficient lighting on traditional desks, particularly in low-light settings. The adjustable angle of the LED light ensures optimal illumination for users, enhancing their study experience.

**Wireless Charging:** Our team has integrated a wireless charging device into the desktop, ensuring a flat and aesthetically pleasing surface. This feature enables convenient charging of learning equipment, eliminating the need for nearby electrical sockets and resolving the problem of low battery power for learning devices.

### 3.4 Stakeholder Requirements

During the design process of the multifunctional table extension, we placed utmost importance on addressing the requirements of key stakeholders, which include Chinese students, DIF.Co, the manufacturer, and investors. These requirements were outlined in Appendix D for reference and guidance.

Foremost, we took into consideration the primary needs of student users. The product needed to be portable and lightweight, allowing for convenient storage in a standard school bag measuring 40 cm (H) x 30 cm (W) x 15 cm (D). With this in mind, we ensured that our product, measuring 30 cm (H) x 20 cm (W) x 4 cm (D), occupies approximately one-third of the backpack's volume when folded, such as in Figure 2. Each detachable board weighs around 1 kg which is easy to carry for students. Moreover, we emphasized student users' safety by incorporating rounded edges to prevent accidental collisions and injuries.



Figure 3. The foldable desk extender

Finally , we recognized the importance of meeting student users' daily study and work requirements. To effectively cater to these needs, Desk Extender+ integrates various learning aids. We have included lights, wireless charging capabilities, an LCD chalkboard, and other support functions for enhanced learning experiences.

At DIF.Co/Investors, our focus was on cost-effectiveness, significant market potential, and a substantial profit margin. To achieve these goals, we opted for using economical and quickly processed pine wood (Irving, 2023) as the primary material, which is also eco-friendly to meet the government's requirements. By offering the product at an affordable \$64.89 for students, we aim to balance affordability and substantial market demand, ultimately leading to a significant profit margin of 29.03% calculated in the business plan.

For the manufacturer, we prioritized mass production capabilities and the potential for a long-term agreement with our company. Through careful analysis of the market potential, it has been determined that we have a large and long-term potential market for our product as its high demand and innovative features.

By considering and addressing the requirements of key stakeholders, we have ensured that our products, with humanization and comprehensive business analysis, will provide students with a more comfortable learning experience while ensuring that our stakeholders will all have considerable profits.

## 4. Product Design Features

—Liu Weixuan 202119061

The Desk Extender+ is a user-friendly product designed to meet the diverse needs of Chinese university students. The product consists of two pieces of wood, 30cm long, 20cm wide, and 4cm thick when folded, connected by hinges that allow for a convenient 180° folding. The moderate size and thin thickness make it easy to store and expand the desktop, while the bracket under the board is fixed with four self-tapping screws, allowing for adaptive fixing to the desktop and folding when not in use.

In addition, the back of the table is fixed with a 7cm diameter circular light with three color patterns, bent and fixed at any angle, and easily stored. Users open the table, fasten it to the table, and then bend the lamp to the desired position, making it very convenient and friendly.

### 4.1 Manufacture

The manufacture of the product does not require a high level of expertise. The main body of the board is cut by the machinery of the product line, with little manual labor or mass production, to ensure accuracy to meet users' needs. Mechanization increases efficiency and benefits product design and production (Gunn, 1982). Aluminum hinges for securing the two planks, brackets, and self-tapping screws were selected for securing the table. After the separate product line is produced, the charging module, writing pad, and lamp are embedded into the board and can be disassembled. All parts are manufactured mechanically, cheaply, and with few on-site workers.

### 4.2 Assembly

The product comprises five fundamental parts, encompassing the body of the wooden board, the bracket, the lighting system, the charging module, and a convenient writing pad. The installation process is straightforward and mechanical, designed to ensure a fuss-free user experience. Upon receiving the Desk Extender+, users can enjoy the ease of use as it comes in a pre-assembled state. Furthermore, should users require customization, the Desk Extender+ can be disassembled and reassembled to fit their needs. This flexibility saves time and allows for an adaptable and personalized user experience.



### 4.3 Maintainability

The Desk Extender+ is designed to require minimal maintenance, making it an ideal product for university students. It is built to last with a durable wooden main body. The desktop stand is fastened securely using four self-tapping screws, while the tablet charging module and small lamp are easily replaceable if required. The Desk Extender+ also features a detachable hinge, allowing each table to be separated and used independently without affecting the other table's functionality.

To ensure the device has sufficient power, we implement a charging module with a capacity of 5000mAh, and the lighting has a capacity of 1200mAh. The Type-C charging port enables a more extended battery life for the device, ensuring it remains fully operational when needed. Charging the Desk Extender+ is effortless; plug the device into its charging port.

Moreover, Desk Extender+ has a one-year warranty for added peace of mind. In the event of any falling parts, users can choose between receiving a replacement via mail or through a Door-to-Door replacement service provided by DIF.Co. Similarly, any internal circuit module failures will be addressed by a team dispatched from DIF.Co. During the warranty period, any maintenance causing faults under regular use will be free of charge. Faults caused by users, however, will incur a fee. Further, any maintenance requests made beyond the warranty period will also be charged.

### 4.4 Safety

The Desk Extender+ was designed with the user's security in mind. The edges and corners of the table were treated with chamfering to eliminate any sharp parts that may cause accidental scratches while in use, particularly for students. All power supplies for Desk Extender+ are wrapped in plastic to ensure user safety. This precautionary measure eliminates the risk of electric shock if the product comes into contact with water. The lights and charging modules also feature rounded corners for safety. Additionally, the table is lightweight to avoid injury from heavy objects, and all screws are concealed to prevent direct contact with the user.

### 4.5 Sustainability

The Desk Extender+ is made from sustainably sourced wood, an environmentally-friendly material. Compared to other manufacturing materials,

wood requires less energy to produce (Falk, 2009). Furthermore, discarded wood boards can be recycled and processed into chips to create new boards, demonstrating the renewability of this material. Wood is also biodegradable and does not create environmental strain.

While aluminum is an excellent metal, producing it from ore requires significant energy. Therefore, recycling aluminum products can significantly contribute to sustainable development (Raabe et al., 2022). The aluminum screws and brackets used in the Desk Extender+ are easy to recycle and reuse. Using mortise and tenon joints and screws without glue means replacement parts can be easily installed. Additionally, when it comes time for recycling, the product can be disassembled, and its various parts can be classified and recycled.

#### 4.6 Usability

The adjustable desk board feature is an efficient function that caters to users' various needs. With no extra tools, users can quickly and efficiently adjust the fixed bracket to their desired desktop thickness, expanding their workspace in seconds. The lightweight nature of the table means it is easy to carry around, allowing users to fold it up and tuck it into their school bags for added convenience.

Moreover, the Desk Extender+ provides essential lighting, charging, and note-taking functions, enhancing the comfort of study and office work. This comprehensive solution ensures users feel satisfied with their Desk Extender+ experience.

#### 4.7 Design Optimization

The product aims to provide college students with a comfortable and convenient study space. During the design iteration process, the following optimizations were made:

1. First-generation product: Multifunctional Table Extension

The initial product displayed in Appendix E was made of a 2cm thick square board, with each component secured with glue. However, this made the product difficult to carry and non-foldable. The glue fixation also made it hard to disassemble and reuse parts, while the exposed metal part of the charging module posed a safety hazard of electric shock.

## 2. Second-generation product: Desk Extender+

The second generation, demonstrated in Appendix C, used self-tapping screws, mortise, and tenon structural fixation products, removing all glue. The edges were chamfered to avoid unnecessary scratching during use. The exposed circuit of the charging module was also concealed. The table thickness was reduced to 1.5cm, and a detachable hinge was added so that two tables could be used separately or combined. Compared with the first generation of products, it is more convenient, portable, and safe.

# 5. Market Potentialrket Potential

——Wu Hao 202119059

## 5.1 Who is our market?

**Problem statement:** How might we solve the problem of the small and insufficient functional desk for students to work?

As students, we often need to work and study in different places and times, but in many cases, the environment is often not able to support our efficient learning (such as lack of large flat desktops, suitable lighting, note-taking, charging devices.), so an excellent and convenient design solution is needed to solve these problems

### 5.1.1 The primary market

Our Desk Extender+ is primarily focused on students in China. It aims to solve the issue discussed in the problem statement regarding the poor environment that reduces learning efficiency. As students, we better understand their needs.

There are a large number of students in China. According to the local government, there are nearly 19 million college students in China. Due to the increasing rate of new students enrolled, the number of university students is still on the rise (Ministry of Education, 2018), which also means that there is a large market for our products because the resources in schools are limited, most of the desks are small and non-functional, so many students need a better desk to improve their learning efficiency, and they are our primary market.

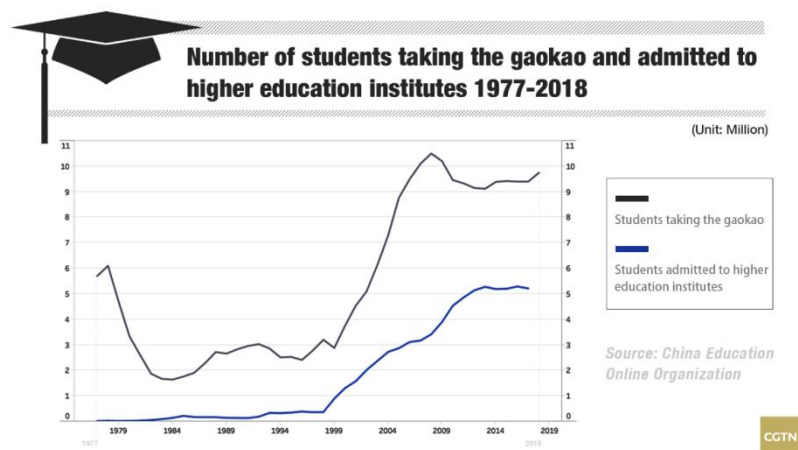


Figure 4. Number of students taking gaokao and admitted to higher education institutes 1977-2018

### 5.1.2 The secondary market

Our Desk Extender+ also focuses on the secondary market, including officers and teachers. According to the data from the Paper News, there are nearly 100 million officers in China (iResearch, 2021), and the Chinese Ministry of Education also shows that over 1.9 million teachers are working in college (Ministry of Education of the People's Republic of China, 2021). According to our analysis of the structure of different industries, 0.45% of officers and 10.5% of teachers need to work in different places with computers or other equipment, that is, about 650,000 potential users in the secondary market. These people also face the problems above and need a good working environment anywhere they want. Therefore, our products will be welcomed by them as well.

### 5.2 Existing products & competitors

Our team researched and compared the advantages and disadvantages of similar existing competitive products in the market to better understand market conditions such as market price range, sales volume, and user preferences.



Figure 5. Competitive products No.1

❖ **Desktop extension board: 59.99A\$**

This cheap desktop extender clips to the edge of the desktop to expand the area.

**Positive features**

1. Expand the using area (52 \* 25cm)
2. Safe, convenient, and user-friendly
3. Recyclable material (Wooden tabletop)

**Negative features**

1. No multifunction
2. Not strong enough to bear much weigh
3. Connect parts are easily damaged
4. Components are non-removable

❖ **Large fixed table: 159A\$**

This is a larger strong fixed table, but it also means a higher price.

**Positive features**

1. Large and flat desktop (80 \* 60 \* 75cm)
2. Strong and robust

**Negative features**

1. No multifunction
2. expensive
3. Heavy and bulky
4. Inconvenient to carry
5. Non-adjustable and Non-foldable



Figure 6. Competitive products No.2





Figure 7. Competitive products No.3

❖ **Multifunctional table: 109 A\$**

This is a multifunctional adjustable table but at a higher price

**Positive features**

6. Flat desktop (60 \* 40 \* 35cm)
7. Multifunction (bracket, Card slot)
8. Adjustable angle and height
9. Lightweight aluminum material

**Negative**

1. Cannot be folded to carry conveniently
2. Expensive
3. Not environmentally friendly

❖ **Foldable small table: 62.99 A\$**

This is a small portable folding table

**Positive features**

1. flat desktop (52.3 \* 30 \* 24.3cm)
2. Anti-slip design of the tabletop
3. Foldable for portability and storage
4. Light

**Negative**

1. No multifunction
2. Not environmentally friendly (plastic)
3. Non-adjustable for angle and height



Figure 8. Competitive products No.4

### 5.3 Desk Extender+ features

Compared to the above products, our Desk Extender+ has many features (presented in the earlier section of the brief) to meet the different needs of the market and make up for the shortcomings of existing products.

1. It can be folded or split for easy portability
2. Highly adaptable expandable desktop
3. Adjustable lighting
4. Wireless charging device

5. Erasable handwritten notepad
6. Eco-friendly and lightweight material
7. Adjustable angle
8. Waterproof and non-slip desktop design
9. Low price
10. Strong and not easily damaged

First, our products use lightweight pine woods as materials of boards, making the product very light, and then use removable hinges so that the table can be folded into a small volume. Users can easily carry and use or store at any time. This design meets the user's suitable needs rather than becoming a burden. It is essential in the market because most existing tables cannot be folded, significantly reducing their practicality. Nevertheless, our products solve this problem successfully.

The second important feature is that our products have a variety of innovations in convenient functions, such as adjustable lighting, note-taking, wireless charging, and angle and height adjustment. It can be clipped on the edge of the desktop for expansion or direct placed so that our products can meet the various needs of users and create an efficient working environment, but currently, no product on the market has such comprehensive functions, so we open a gap in the market and can use it to attract a large number of users. In addition, the selling price of our products is only 64.89A\$, which is very low, because the devices the products that are close to our price are much more rudimentary than ours, which also dramatically promotes the purchase, especially for students.

Finally, we compensate for the disadvantage of existing products that cannot be disassembled into parts, making our product possible to replace the broken parts instead of throwing them away, improving its sustainability and the design of our products also greatly meets the relevant needs of the secondary market, such as older office workers who may be more concerned with robustness and lighting conditioning and the quality of the product.

### 5.4 Potential Market

According to the Desk Extender+ Market Survey Questionnaire listed in Appendix A, 29 % of the university students surveyed expressed their relatively high demand for Desk Extender+; We can roughly deduce that among the 19 million college students, there are about 5.5 million potential customers of our products in the primary markets, and 650,000 potential users in the secondary market. Then, based on the analysis and comparison of similar products on the market and the statistics of our market questionnaire, we expect to attract 18% of the total market of 6.15 million people, which means 1.107 million potential users. In addition, more than 4.4 million new students are enrolled in China every year (Chinese Bureau of Statistics, 2021), and we aim to capture a 2% share of this growing market per year. Based on our following analysis, we expect to sell 750 copies monthly and pay back within ten months.

However, in the current situation, especially after the pandemic, universities continue to invest in infrastructure, including more prominent and efficient desks. We have also noticed that not all graduates take their previous purchases, and some choose to resell them to their juniors. All of the factors above may affect the market for our products, so we do not have the means to make accurate estimates.

Overall, our Desk Extender+ has an ample market and opportunity to attract customers. We conducted experiments and surveys on students on our campus. According to the first-hand data obtained, our Desk Extender+ can help to solve their various problems and improve learning efficiency. If DIF.co can find reliable manufacturing procedures and sales solutions, our products will be incredibly successful.

## 6. Product Business Plan

——Yu Zexiang 202119039

The sale target of our product, Desk Extender+, is university students and any other people who need to work on a mobile basis. Primary use cases include working in a crowded classroom only equipped with small tables and temporarily studying in the dormitory. Desk Extender+ can provide users with a comfortable learning environment. The people who need to work productively in non-fixed locations are

also our customers; they often bring their laptops or notebook to similar places. Desk Extender+ will provide a comfortable and robust environment to enhance user experience and work or studying efficiency.

## 6.1 Cost and Budget

Our initial planned manufacture and sales are concentrated in China. Production lines can be established easily in China, with a relatively lower production cost for complex electronic components.

We also pay close attention to cost-effectiveness. Although the considerable market potential exists, we might not gain significant returns in the first step caused by insufficient publicity efforts. So, in the end, there is sensitivity analysis to address the risks of change and to guide actions in the following steps.

### 6.1.1 Total fixed costs

Our financial statement logged hours of 6 design engineers working on designing and meeting. The cost for Design engineers was calculated to be \$33,744.90 . Pre-production costs are the subsequent fixed costs. This includes prototyping, set-up for manufacture, worker training, and pre-production marketing.

The material we purchased to create the alpha prototype was 81 dollars. The quotation for prototype manufacture is \$50 . Also, we reserved 250 dollars as a future prototyping budget. After the product design is finalized, we must prepare for the market launch.

The cost for manufacturing set-up adds up to a total of \$69,481.00 . The following is a breakdown of each major component.

#### 1. Manufacturing set-up: \$55,000.00

This cost occupies a relatively significant proportion; it includes equipment purchase, wood processing, assembly, casting mold production, security control, and rental of the production site. These costs are necessary to ensure the smooth operation of the production line and the production of the desired products or components.

#### 2. Training workers: \$6,200.00

\$3,750.00 for training machine operators to adapt to the production line

\$2,500.00 for training assembly workers who install all the parts into the final

product

3. Packaging Design and Manufacture: \$2,250.00

This cost represents the expenses related to the design and manufacturing of product packaging materials. It includes creating visually appealing and functional packaging designs and producing packaging materials.

4. User Specification: \$3,000.00

The user specification cost covers the customization of packaging based on specific user requirements or preferences. It involves incorporating design elements or features the customer requests to meet their needs.

5. Advertising: \$2,600.00

The advertising cost is the expense of promoting and marketing the product packaging. It includes designing and producing advertisements, selecting media channels for promotion, and running advertising campaigns to increase brand visibility and attract customers.

6.1.2 Variable Costs

The main body of Desk Extender+ is pine board, and our team obtained wholesale quotations for all components. Chinese factories can provide a high-cost performance manufacturing process. Due to it needing many manual installations, half of the cost is spent on workers. We have a low transportation cost because of the light weight of Desk Extender+ and the geographical advantage of DIF.co.



The total cost of manufacturing each unit is shown in the table below.

Table 1 Total cost of manufacturing each unit

Variable Costs	Price
Product Components	\$23.35
Labor Costs	\$26.85
Distribution costs	\$0.11
Total	\$50.29

## 6.2 Revenue and Profit

According to market analysis conducted by our team, there is a large potential market. However, our market expectation is relatively conservative because not all students want to try this new product. Based on market potential, our team estimates its monthly sales at 750. We mainly choose e-commerce stores to sell Desk Extenders+. Advertisements will be placed on social media sites, and we also plan to carry out various promotional activities before and after the product launch.

### 6.2.1 Cost-plus pricing

We adopt this pricing strategy to determine the selling price by adding a markup or profit margin to the cost of production.

Considering the price of a non-functional Desktop extension board is 59.99\$, and a non-foldable multifunctional table is 109\$, we finally choose the retail price of Desk Extender+ is \$64.89, while our markup percentage can reach 29.03%. This price ensures both competitiveness and sufficient profit margins.

After analyzing the market potential in the early stage, we can know that the selling price is close to the expected market price and has a considerable profit potential for the company, but operating costs and after-sales service still need to be taken into account. However, as mentioned earlier, this process ignores market dynamics. We will ensure that the final pricing decision is aligned with market conditions and maximizes profitability by not less than 25% for each item.

### 6.2.2 Break-even analysis

The break-even analysis helps determine the sales volume required to cover all fixed costs and reach the break-even point. We have the table shown below:

Table 2 Costs of each part

Sales / Month	Sell Price	Unit Variable Cost	Total Fixed Costs
750	\$64.89	\$50.29	\$103,225.90

$$\begin{aligned}\text{Unit Contribution Margin} &= \text{Sell Price} - \text{Unit Variable Cost} \\ &= \$64.89 - \$50.29 = \$14.60\end{aligned}$$

$$\begin{aligned}\text{Break - Even Quantity} &= \text{Total Fixed Costs} / \text{Unit Contribution Margin} \\ &= \$103,225.90 / \$14.60 \approx 7,072.22\end{aligned}$$

$$\begin{aligned}\text{Break - Even Time} &= \text{Break - Even Quantity} / (\text{Sales} / \text{Month}) \\ &= 7,073.22 / 750 \approx 10 \text{ months}\end{aligned}$$

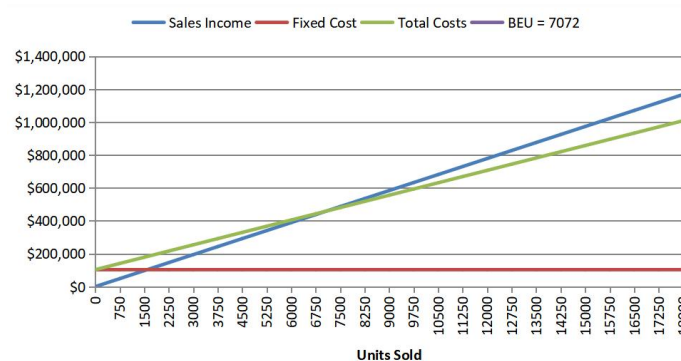


Figure 9. Break-even analysis

We need to sell 7,072 units to break even based on current costs. From the table, it can be seen that we will profit after ten months. Also, if it can be sold for 24 months, the net sales are up to \$159,521.32. We will have ample funds to improve Desk Extender+ or launch a new generation to win a more extensive market with more sales.

### 6.2.3 Sensitivity Analysis

To examine how changes in sales volume impact the profitability of the product. We will change one variable while others are constant.

#### 1. Change in Average Monthly Sales

A change of  $-10.0\%$  does not affect the break-even point, but a month's

break-even time is delayed.

## 2. Change in Sell Price

A change of  $-10.0\%$  in sell price raises the break-even point to 12,735 units and a percentage change of  $-273.4\%$ . This has a significant impact on our plan.

## 3. Change in Parts and Components

A 10% cost increase has a limited impact, causing the break-even point to rise to 8419 units. We have a minor loss than the price reduction.

The conclusion is that our project is price sensitive because of its relatively high sales. A small change in the selling price or variable costs may lead to a significant change in profit. So we need to reduce unnecessary costs to obtain greater profits in the later stages of business.

# 7. Conclusions and Recommendations —Liu Ziqing 202119010

Through our product design and subsequent market analysis, business proposition, and revenue analysis, we strongly recommend that DIF.co continue to increase its investment in Desk Extender+ and produce it. Its innovation effectively addresses the shortcomings and issues of similar products, making it stand out in the market quickly. Specifically, it caters to the learning needs of college students, provides them with a convenient learning space, and resolves the problem of limited desktop expansion. As a result, it will be highly favored by college students.

At the same time, with the expansion of the scale of college students and the increase in the requirements for the learning environment, our Desk Extender+ will be more favored by college students, especially when the innovation and competitiveness of this product are becoming more and more prominent. On this basis, the market scale will expand further, especially when many new students enter college in September.

In addition to this, through market research and analysis, we completed a financial statement, which provides a complete evaluation and forecast of the production and profitability of the entire product. By assessing market potential and cost fluctuations, the break-even point will be completed within ten months after Desk Extender+ enters the market, and this figure will be even more impressed with

the linear growth in the number of college students. This is a rare financial opportunity where the market is outstandingly broad, the returns are high, and the investment risk is shallow while keeping the investment low. At the same time, it is also an excellent opportunity for DIF.Co to enter the college student market.

Finally, by combining factors and analysis, we made the following recommendations for DIF.Co:

1. Product testing: Before the start of mass production, the safety and quality of the table panels are tested, including the treatment of sharp parts, the maximum load capacity (expected to be between 15 – 25kg), and the strength test of the wood board

2. User feedback: When the safety and high quality of the product are determined, the product is provided to some users for use, and the user is kept in touch during the trial period in order to keep abreast of defects and vulnerabilities to complete optimization or design changes in time, which will ensure that the problems encountered in more significant batch production are reduced, and better user feedback and higher benefits are obtained

3. Market launch: The products are sold to the whole country after being put into production, and at the same time, a department is set up to follow up on the sales situation at any time and carry out necessary analysis and adjustments. At the same time, continue to receive user feedback to facilitate product upgrades and function upgrades.

4. Future improvements: In the case of sufficient market launch and user feedback, the necessary improvement of the product, including part materials or composition, color, and individual demand design, can also be used as the part that can be improved.

## 8. Reference

—Liu Weixuan 202119061

- Irving, M. (2023, February 12). Best Wood For A Desk Top (Top 15 Best Types Of Wood) - Desks Guide. *Desks Guide*. <https://desksguide.com/best-wood-for-a-desk-top/>
- Castellucci, H., Arezes, P., Molenbroek, J. F., De Bruin, R., & Viviani, C. (2017). The influence of school furniture on students' performance and physical responses: results of a systematic review. *Ergonomics*, 60(1), 93–110. <https://doi.org/10.1080/00140139.2016.1170889>
- Dorman, J. P. (2014). Classroom psychosocial environment and course experiences in pre-service teacher education courses at an Australian university. *Studies in Higher Education*, 39(1), 34–47. <https://doi.org/10.1080/03075079.2012.674936>
- Falk, B. (2009). Wood is a sustainable building material.
- Gunn, T. G. (1982). The mechanization of design and manufacturing. *Scientific American*, 247(3), 114–131.
- Raabe, D., Ponge, D., Uggowitzer, P. J., Roscher, M., Paolantonio, M., Liu, C., ... & Pogatscher, S. (2022). Making sustainable aluminum by recycling scrap: The science of “dirty” alloys. *Progress in materials science*, 128, 100947.
- Ministry of Education of the People's Republic of China. (2018). Number of Schools, Educational Personnel, and Full-time Teachers by Type and Level . [http://www.moe.gov.cn/jyb\\_sjzl/moe\\_560/2021/quanguo/202301/t20230104\\_1038068.html](http://www.moe.gov.cn/jyb_sjzl/moe_560/2021/quanguo/202301/t20230104_1038068.html) (moe.gov.cn)
- IRResearch. (2021). The paper. 2021 China White-collar Consumption and Workplace Social Research Report [https://www.thepaper.cn/newsDetail\\_forward\\_14078716](https://www.thepaper.cn/newsDetail_forward_14078716)
- Ministry of Education of the People's Republic of China. (2018). Number of Students of Formal Education by Type and Level. Number of Students of Formal Education by Type and Level - Ministry of Education of the People's Republic of China (moe.gov.cn)
- Chinese Ministry of Education. (2021). *Student numbers and characteristics*. [http://www.moe.gov.cn/fbh/live/2023/55167/mtbd/202303/t20230324\\_1052473.html](http://www.moe.gov.cn/fbh/live/2023/55167/mtbd/202303/t20230324_1052473.html)



## 9. Appendices

——Zhang Bairui 202119037

### Appendix A: Market survey questionnaire and the results (70 Chinese college students participated in the questionnaire)

#### Desk Extender Market Survey Questionnair

In order to provide you with better service, we hope you can take a few minutes to share your feelings and suggestions with us. We are looking forward to your early reply.

\* **01** Currently, are you satisfied with the size and functionality of the desktop in your class or dormitory?

	Very dissatisfied	Dissatisfied	Medium	Satisfied	Very satisfied
degree of satisfaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* **02** As a student, have you ever encountered the problem of limited desktop space

- ☐ Yes, I have
- ☐ I don't know
- ☐ No, I haven't

\* **03** Do you demand an extra desk space for studying or working?

- ☐ Highly in demand
- ☐ Medium in demand
- ☐ Low in demand
- ☐ No demand

\* **04** Do you think extra desk space will help your study

- ☐ Yes
- ☐ No

Answer for Q1:

The degree	Very dissatisfied	Dissatisfied	Medium	Satisfied	Very satisfied
degree of satisfaction	23	22	20	4	1

Answer for Q2:

Option	Percentage%	Count
Yes,I have	58.6%	41
I don't know	18.6%	13
No, I haven't	22.9%	16

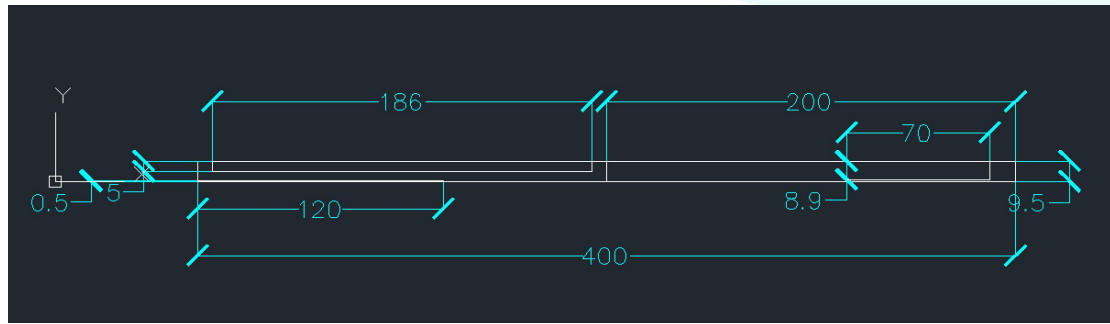
Answer for Q3:

Option	Percentage%	Count
Highly in demand	10%	7
Medium in demand	19%	13
Low in demand	46%	32
No demand	26%	18

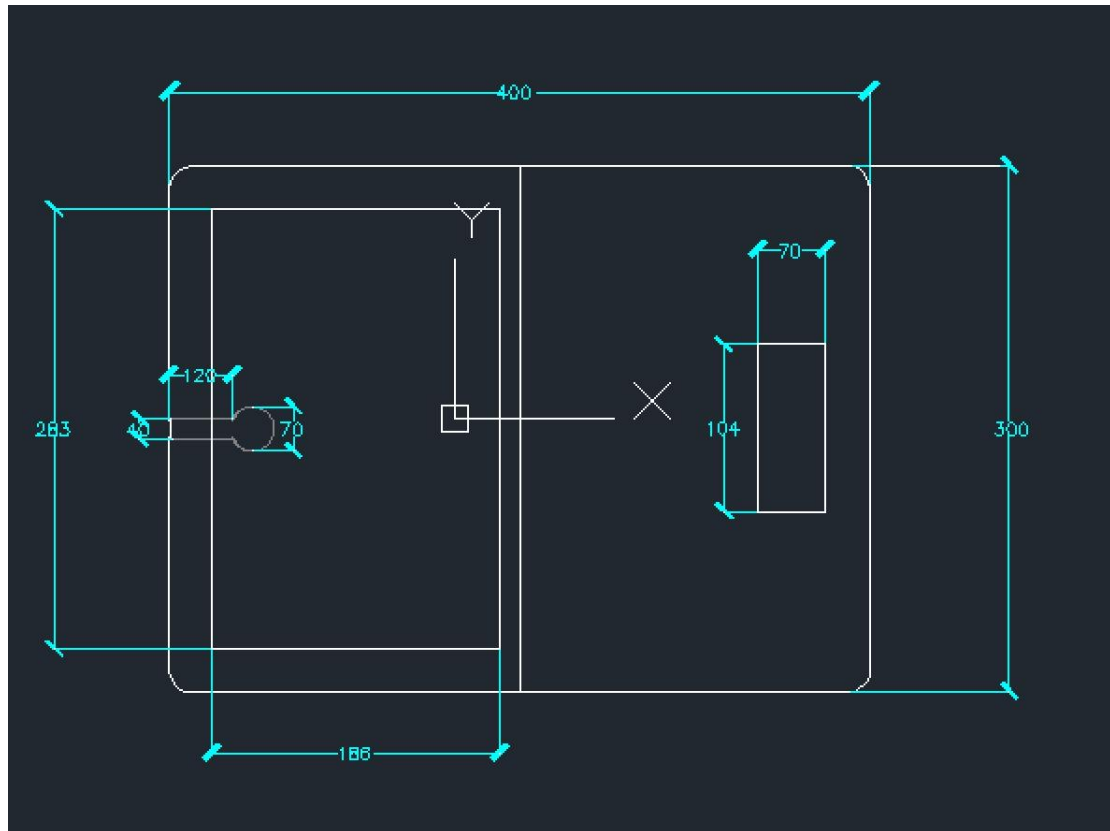
Answer for Q4:

Option	Percentage%	Count
Yes	54%	38
No	46%	32

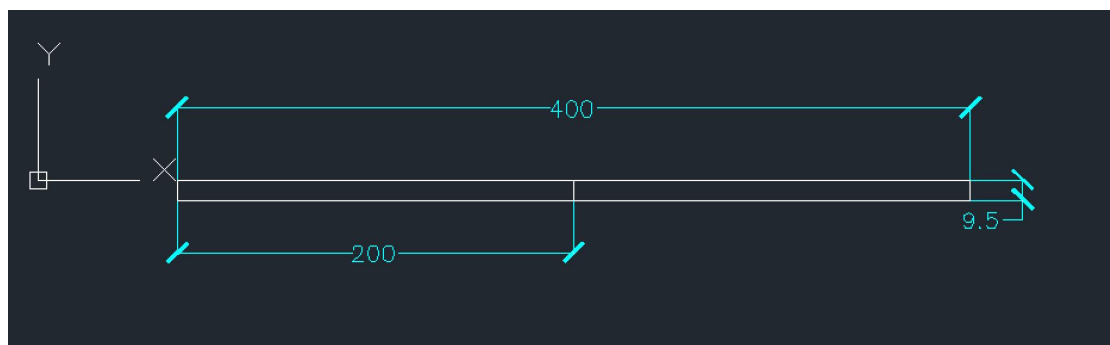
# Appendix B: Wooden board cutting diagrams —Liu Ziqing



Section view

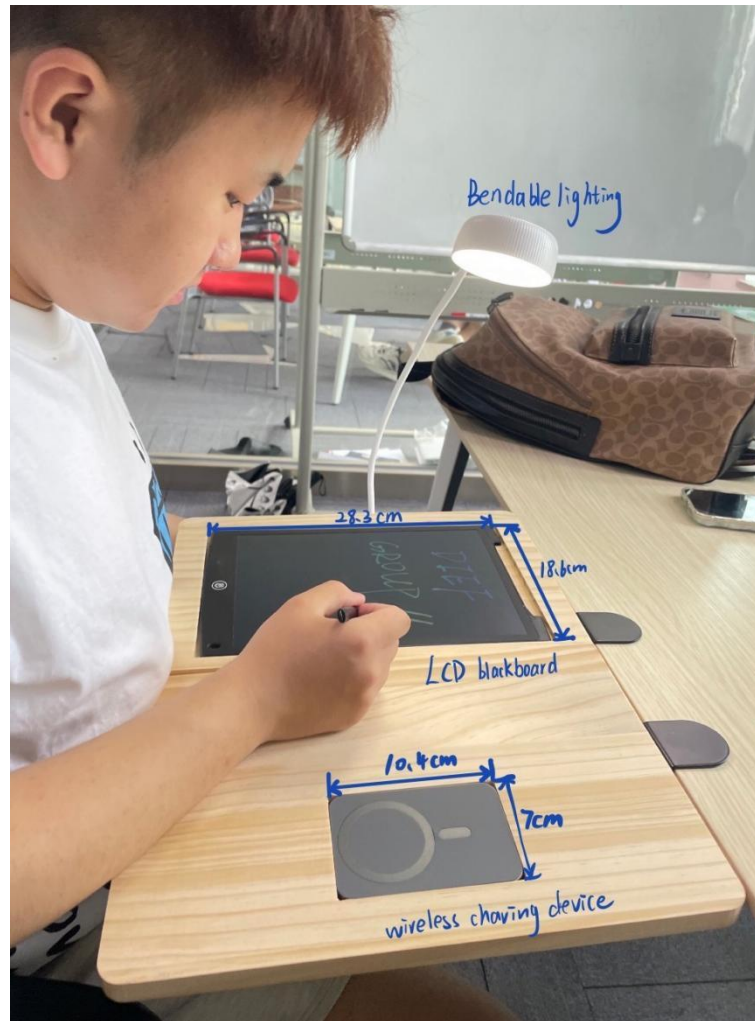
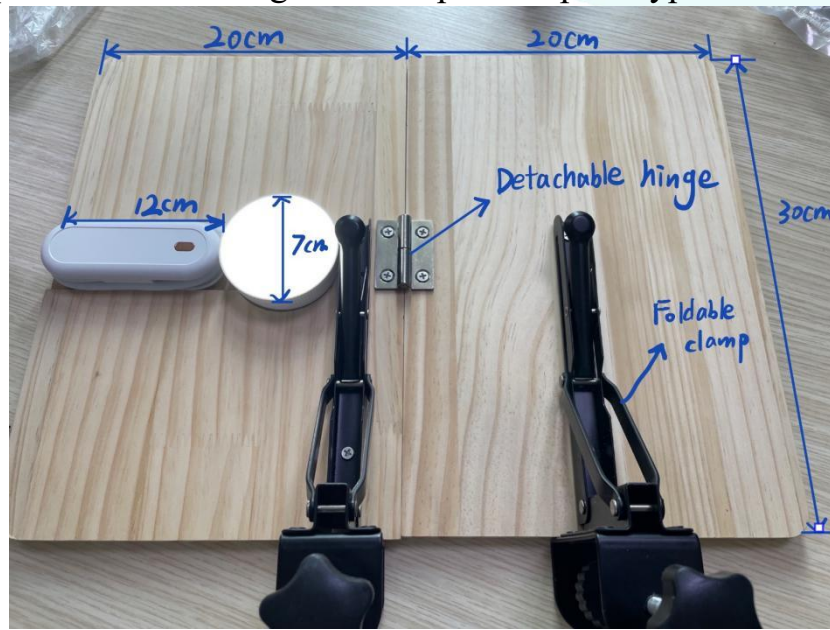


Plan view



Elevation view

## Appendix C: Second-generation product prototype



## Appendix D: Requirements Table

(The higher the number, the higher the priority)

Group 1      Product Requirements      Product Name: Desk Extender+

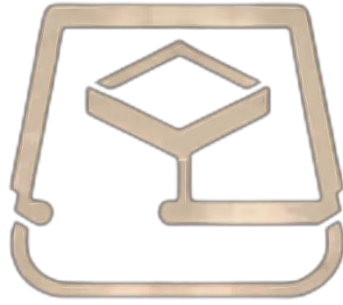
ID	Requirement	Source	Verification/Test Strategy	Priority
R001	The desk extender is easy to carry.	User need	Test the prototype with volunteer users. The using reports are collected after 6 hours. More than 90% users are supposed to report that the product is very convenient to carry out.	10
R002	The desk extensder can record key information.	User need	Write something on the whiteboard of the expansion board and see if it is easy to write, clear, and legible	4
R003	The table expansion board can provide power to mobile devices when necessary	User need	Test the prototype with Apple and Android mobile phone seperately. Check whether the phone can be charged and how many power can it provide to the device	4
R004	The price of table expansion boards should be suitable	User need	List the various costs required to manufacture a multifunctional table board and compare it with ordinary table boards on the market	8
R005	The table extension can afford a heavy load.	User need	A 20kg object placed on the expansion plate will pass the test if there is no deformation and damage after eight hours	8
R006	The Table can be illuminated in dark environments.	User need	The table is equipped with a small lamp. Put a variety of books on top and see if they are illuminated effectively and not obscured by shadows.	4
R007	The potential danger of the table should be as low as possible.	User need	For the user's safety. The using reports are collected after 6 hours. More than 95% users are supposed to report that the product is very safe to carry out.	9
R008	The product should use recycled materials to reduce its carbon footprint.	Government/Manuf acturers	Test whether the material is 100% recyclable.	8
R09	The product should conform to ergonomic structure	User need	Test the beta prototype with volunteer users. Gather responses 10 after 8 hours. 90% of users must report no discomfort	8
R010	It needs to be lightweight and portable	User need	Use lightweight collapsible materials	6
R011	The table needs to be waterproof and non-slip	User need	Use special materials and then splash to the product check whether the product function well	2
R012	The market demand for products requires a large profit margin	DIF.Co/Investors	Analyze the market potential and evaluate the business plan to estimate the costs and calculate break-even point to test if there have a large profit margin	9
R013	The product has a long-term manufacturing demand	Manufacturers	Analyzing the breakeven point of a product through break even analysis and the maket potential todetermine whether the product will be manufactured for a long time.	4



## Appendix E: First-generation product prototype



## Appendix F: Logo of our product



## Appendix G: 3D rendering of the product





## Appendix H: Sensitivity analysis

Months	Units Sold	Sales Income	Variable Cost	Fixed Cost	Total Costs	Nett Sales
0	0	\$0	\$0	\$103,226	\$103,226	(\$103,225.90)
1	750	\$48,668	\$39,471	\$103,226	\$142,697	(\$94,029.35)
2	1500	\$97,335	\$78,942	\$103,226	\$182,168	(\$84,832.80)
3	2250	\$146,003	\$118,413	\$103,226	\$221,639	(\$75,636.25)
4	3000	\$194,670	\$157,884	\$103,226	\$261,110	(\$66,439.70)
5	3750	\$243,338	\$197,355	\$103,226	\$300,581	(\$57,243.15)
6	4500	\$292,005	\$236,826	\$103,226	\$340,052	(\$48,046.60)
7	5250	\$340,673	\$276,297	\$103,226	\$379,523	(\$38,850.05)
8	6000	\$389,340	\$315,768	\$103,226	\$418,993	(\$29,653.50)
9	6750	\$438,008	\$355,239	\$103,226	\$458,464	(\$20,456.95)
10	7500	\$486,675	\$394,709	\$103,226	\$497,935	(\$11,260.40)
11	8250	\$535,343	\$434,180	\$103,226	\$537,406	(\$2,063.85)
12	9000	\$584,010	\$473,651	\$103,226	\$576,877	\$7,132.71
13	9750	\$632,678	\$513,122	\$103,226	\$616,348	\$16,329.26
14	10500	\$681,345	\$552,593	\$103,226	\$655,819	\$25,525.81
15	11250	\$730,013	\$592,064	\$103,226	\$695,290	\$34,722.36
16	12000	\$778,680	\$631,535	\$103,226	\$734,761	\$43,918.91
17	12750	\$827,348	\$671,006	\$103,226	\$774,232	\$53,115.46
18	13500	\$876,015	\$710,477	\$103,226	\$813,703	\$62,312.01
19	14250	\$924,683	\$749,948	\$103,226	\$853,174	\$71,508.56
20	15000	\$973,350	\$789,419	\$103,226	\$892,645	\$80,705.11
21	15750	\$1,022,018	\$828,890	\$103,226	\$932,116	\$89,901.66
22	16500	\$1,070,685	\$868,361	\$103,226	\$971,587	\$99,098.21
23	17250	\$1,119,353	\$907,832	\$103,226	\$1,011,058	\$108,294.76
24	18000	\$1,168,020	\$947,303	\$103,226	\$1,050,529	\$117,491.32

Break Even Units	Break Even Sales	2 Year Profit	Profit Change	Percentage Change
7072	\$458,902.08	\$133,246.59	(26,274.72)	-19.7%

### Change in average monthly sales

Months	Units Sold	Sales Income	Variable Cost	Fixed Cost	Total Costs	Nett Sales
0	0	\$0	\$0	\$103,226	\$103,226	(\$103,225.90)
1	675	\$43,801	\$33,948	\$103,226	\$137,174	(\$93,372.88)
2	1350	\$87,602	\$67,895	\$103,226	\$171,121	(\$83,519.86)
3	2025	\$131,402	\$101,843	\$103,226	\$205,069	(\$73,666.84)
4	2700	\$175,203	\$135,791	\$103,226	\$239,017	(\$63,813.82)
5	3375	\$219,004	\$169,739	\$103,226	\$272,965	(\$53,960.80)
6	4050	\$262,805	\$203,686	\$103,226	\$306,912	(\$44,107.78)
7	4725	\$306,605	\$237,634	\$103,226	\$340,860	(\$34,254.76)
8	5400	\$350,406	\$271,582	\$103,226	\$374,808	(\$24,401.74)
9	6075	\$394,207	\$305,530	\$103,226	\$408,755	(\$14,548.72)
10	6750	\$438,008	\$339,477	\$103,226	\$442,703	(\$4,695.70)
11	7425	\$481,808	\$373,425	\$103,226	\$476,651	\$5,157.32
12	8100	\$525,609	\$407,373	\$103,226	\$510,599	\$15,010.34
13	8775	\$569,410	\$441,320	\$103,226	\$544,546	\$24,863.36
14	9450	\$613,211	\$475,268	\$103,226	\$578,494	\$34,716.39
15	10125	\$657,011	\$509,216	\$103,226	\$612,442	\$44,569.41
16	10800	\$700,812	\$543,164	\$103,226	\$646,390	\$54,422.43
17	11475	\$744,613	\$577,111	\$103,226	\$680,337	\$64,275.45
18	12150	\$788,414	\$611,059	\$103,226	\$714,285	\$74,128.47
19	12825	\$832,214	\$645,007	\$103,226	\$748,233	\$83,981.49
20	13500	\$876,015	\$678,955	\$103,226	\$782,180	\$93,834.51
21	14175	\$919,816	\$712,902	\$103,226	\$816,128	\$103,687.53
22	14850	\$963,617	\$746,850	\$103,226	\$850,076	\$113,540.55
23	15525	\$1,007,417	\$780,798	\$103,226	\$884,024	\$123,393.57
24	16200	\$1,051,218	\$814,746	\$103,226	\$917,971	\$133,246.59

Break Even Units	Break Even Sales	2 Year Profit	Profit Change	Percentage Change
12732	\$743,561.53	\$42,719.32	(116,802.00)	-273.4%

### Change in sell price

Months	Units Sold	Sales Income	Variable Cost	Fixed Cost	Total Costs	Nett Sales
0	0	\$0	\$0	\$103,226	\$103,226	(\$103,225.90)
1	750	\$43,801	\$37,720	\$103,226	\$140,946	(\$97,144.85)
2	1500	\$87,602	\$75,439	\$103,226	\$178,665	(\$91,063.80)
3	2250	\$131,402	\$113,159	\$103,226	\$216,385	(\$84,982.75)
4	3000	\$175,203	\$150,879	\$103,226	\$254,105	(\$78,901.70)
5	3750	\$219,004	\$188,598	\$103,226	\$291,824	(\$72,820.65)
6	4500	\$262,805	\$226,318	\$103,226	\$329,544	(\$66,739.60)
7	5250	\$306,605	\$264,038	\$103,226	\$367,264	(\$60,658.55)
8	6000	\$350,406	\$301,758	\$103,226	\$404,983	(\$54,577.50)
9	6750	\$394,207	\$339,477	\$103,226	\$442,703	(\$48,496.45)
10	7500	\$438,008	\$377,197	\$103,226	\$480,423	(\$42,415.40)
11	8250	\$481,808	\$414,917	\$103,226	\$518,143	(\$36,334.35)
12	9000	\$525,609	\$452,636	\$103,226	\$555,862	(\$30,253.29)
13	9750	\$569,410	\$490,356	\$103,226	\$593,582	(\$24,172.24)
14	10500	\$613,211	\$528,076	\$103,226	\$631,302	(\$18,091.19)
15	11250	\$657,011	\$565,795	\$103,226	\$669,021	(\$12,010.14)
16	12000	\$700,812	\$603,515	\$103,226	\$706,741	(\$5,929.09)
17	12750	\$744,613	\$641,235	\$103,226	\$744,461	\$151.96
18	13500	\$788,414	\$678,955	\$103,226	\$782,180	\$6,233.01
19	14250	\$832,214	\$716,674	\$103,226	\$819,900	\$12,314.06
20	15000	\$876,015	\$754,394	\$103,226	\$857,620	\$18,395.11
21	15750	\$919,816	\$792,114	\$103,226	\$895,340	\$24,476.16
22	16500	\$963,617	\$829,833	\$103,226	\$933,059	\$30,557.21
23	17250	\$1,007,417	\$867,553	\$103,226	\$970,779	\$36,638.26
24	18000	\$1,051,218	\$905,273	\$103,226	\$1,008,499	\$42,719.32

Break Even Units	Break Even Sales	2 Year Profit	Profit Change	Percentage Change
8419	\$546,308.91	\$117,491.32	(42,030.00)	-35.8%

### Change in parts and components