

An Investigation of A White Noise-based App for Improving Sleep Quality

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Abstract: ‘Sleeell’ (sleep well) is an application designed to solve users' sleep problems. Our goal is to help users solve the problem of difficulty falling asleep and help users develop the habit of going to bed early. We plan to focus on the difficulty of falling asleep among female college students. (Software emphasizes the benefits of different types of white noise and offers unique sleep aid recommendations.) Our market research was mainly conducted at the University of Nottingham Ningbo in Ningbo, Zhejiang Province, China, and we found that more than 60% of our target users were willing to try our application. Our business model is to charge by subscribing to the app. Users can choose to subscribe to the app to unlock all advanced features. We believe our app has great potential, as our survey found that more than 70% of female college students have difficulty falling asleep and would like to solve it. And our app is different from the normal sleep-related apps on the market. Our app also focuses on cultivating early bedtime habits.

Keywords: A good sleep habit, White noise, An innovative app.

1. Introduction

Sleeell is a functional app loaded on a mobile phone that links female college students with sleep problems to possible solutions. Our software is currently only aimed at providing a possible solution to the problem of female college students having difficulty falling asleep.

Our software is open to female college students, aiming to enable female college students with sleep problems to improve or even solve their sleep problems by using specific functions in the software. We offer different sleep aid options in the app: white noise, meditation, bedtime stories, autonomous sensory meridian response videos. Users can choose their own sleep aid measures according to their preferences and needs. Users use our software to solve their sleep problems, and we make money by charging them a membership fee. Different from other sleep aid apps on the market, our app Sleeell mainly uses white noise to balance the environment. The white noise in our software can be manually adjusted based on the frequency of sounds around the user falling asleep. For example, if the ambient sound frequency is 30 decibels while the user is asleep, the user can adjust the white noise frequency between 30 and 40 decibels. In addition, 21Sleep also focuses on cultivating the habit of going to bed early. Users can set a regular bedtime each day and use the app's reward system to monitor users to develop a regular sleep schedule (see below for details).

2. Organization of the Text

Business Overview

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2.1. Section Headings

Product

Our product is an application to help female college students alleviate and gradually solve their problems of staying up late and sleeping late. We surveyed ten male and female college students, and according to the survey results. Although most of them have a serious problem of staying up late, girls want to be solved to a much greater extent than boys. After this result, we interviewed 20 girls from different grades in our school. We found that 18 female college students had problems staying up late at night and 80 percent of them reported staying up completely seven days a week. According to our team's investigation, we interviewed 20 girls from different grades in our school. We found that 18 female college students had problems staying up late at night and 80 percent of them reported staying up completely seven days a week. Meanwhile, 75 per cent of them strongly hope their problem of staying up late could be solved. According to their answers, they considered that staying up late had caused them physical harm, including headache and eye discomfort caused by the light from the phone. In addition, females have higher rates of late nights and sleep difficulties in early adulthood than men, and they also sleep for shorter periods of time

(Buboltz et al., 2001). Based on our research and the fact that women have a harder time falling asleep, our software will aim to help females adopt an early bedtime habit for 21 days because Dr. Maltz has suggested that 21 days can be a routine. Our survey also found that the main reason why most girls don't get into the habit of going to bed early is that they don't consider they have the motivation to keep going to bed early in the long term. They think they have formed a habit of staying up late, and it is difficult for them to go to bed early without encouragement and supervision. Our application aims to help users solve the problem of staying up late by encouraging them to get into the habit of going to bed earlier. We give out prizes of varying value at different times of the 21-day period. These prizes include steam eye masks, ice silk eye masks and night lights to help people sleep quicker. The products we distribute are designed to help people sleep better. This echoes our main purpose. Compared with the existing mobile sleep application, we found that most of the functions are to record people's daily sleeping time and some white noise to help them sleep. However, these functions are not effective in improving people's late sleeping habits. As a result, the advantage of our software is that it gives female college students an incentive to go to bed early through periodic sleep aid prizes. Since we want consistent users to use our software, we will offer higher value prizes, such as bed sheets and mattresses, to users who stick with our software for one year and go to bed early 80% of the year. However, our application also has some potential disadvantages. For example, the initial investment cost will be relatively high and it will take a certain amount of time to recover the cost.

Innovativeness

Our product is based on the fact that female college students feel less motivated to go to bed early even though they want to. However, apps on their phones have failed to encourage them to go to bed earlier. Our app can motivate them without missing the features of the original app, such as different kinds of white noise, depending on the user's preferences and mood of the day. At the same time, our software can also detect the frequency of indoor sound to select the appropriate frequency of white noise. Our innovation can attract more female college students with sleep difficulties to join us and develop the habit of going to bed early. In addition, some other functions that can help people sleep better are included, such as, sleep stories with different themes, some voice records from idols so that users can choose which they prefer and using meditation to encourage people to fall asleep faster. Our prize can help them have better sleep quality. They just need to keep recording their accurate sleep time on our software and keep falling asleep at around 11 o'clock for 21 days to get our prize. After the 21-day task, when they had reached an 80 percent early bedtime rate a year, the higher-value prize was more attractive for them to stick with. They can improve their staying up late while getting the prize. After the improvement of staying up late, their physical problems caused by staying up late, such as headache and weakness, will also improve.

Industry and market analysis

We conducted thorough market research and analysis, with a focus on understanding the sleeping patterns and needs of university students. Our aim was to identify the pain points and challenges that students face when it comes to getting quality sleep. We interviewed 20 students from different universities and backgrounds, which helped us to identify

common themes and patterns.

We found that insomnia is a significant issue among university students, with many factors contributing to the problem, including academic stress, lifestyle choices, and emotional well-being. However, through further analysis of our data, we found that female students were more inclined to prioritize helping them to fall asleep than their male counterparts. This insight led us to focus our efforts on developing a solution that caters to the unique needs and preferences of female university students.

Competitor analysis

Through communication with females, their demands for pursuing good sleep are different. Hence, we decide to create a software application to cater to their various needs. It is worth noting that female students who are disturbed by insomnia are more sensitive to the surrounding environment than normal ones. (Van Someren, 2021). It is important to provide an app to them, which helps them easier to fall asleep more frequently. Our first feature is brought by the research taken before. For the current market, their potential customers are all people who are experiencing sleeping disorders. However, we only targeted female university students. Our group members are all university students, hence the targeted customers who are influenced by sleeping problems are our peers. We know more about our peers than people who are in the workplace.

Hence, potential customers will be more likely to be drawn in.

The next one is the introduction of adjustable frequencies of white noise used by customers in the software, which makes the surrounding sound level and frequency level of white noise in balanced way. Recently, white noise appeared in many prevalent apps. The principle of this white noise is to block disruptive sounds in the bedroom environment somewhat. (Riedy et al., 2021) However, for the special target group of university females, we create a concept which adjusts the frequency range of white noise. The range of this is from 20Hz to 20,000Hz in general. (Sasha, 2022). Due to the sensitivity of female students to environmental noises, we planned to provide an intelligent button to users that can increase or decrease the white noise frequency manually according to the sound level around their beds. For example, if the sound in a bedroom is about 30 Hz, then users can set the frequency of white noise to about 30 Hz, which will help them better to fall asleep. Therefore, differing from our competitors, our target users are able to check the current bedside sound data on the app. Moreover, they can fall asleep passively or proactively; they can try to lower the sound level if the source of the sound is in the room. If not, they can choose this application to aid them, according to the sound data they collect, applying other suitable features like meditation space. By incorporating this feature, we aim to provide a tailored solution that meets the unique needs of our target users.

Our primary goal is to provide an application that addresses the unique sleep demands of female university students. By taking into account their sensitivity to environmental noises, we aim to help them fall asleep and promote their overall well-being.

Our software application for sleeping aid in female university students goes beyond the basic features of other prevalent sleep applications currently available in the market. In addition to incorporating features such as meditation, breathing activities, and bedtime rituals, we also have

designed a unique reward system that caters to girls' preferences.

Finally, we have also introduced an incentive scheme for positive feedback on female students' sleep. Our reward system is more creative and effective than that of current applications. We understand that females value the quality of their sleep and appreciate gifts that contribute to their overall well-being. Therefore, we offer rewards such as steam eye masks, night lights, and foot soakers, all branded with our application logo, to users who demonstrate consistent good sleep habits. Our reward system operates on time intervals of 3 days, 7 days, and 21 days, providing users with achievable goals to develop good sleep habits.

Our unique reward system is an effective tool for promoting self-discipline in females and encouraging them to prioritize their sleep quality. By providing rewards that are both useful and branded with our application logo, we aim to increase user engagement and retention. Our approach recognizes the importance of making healthy sleep habits enjoyable and encourages our users to incorporate good sleep habits into their daily lives.

In conclusion, we have three competitive advantages over the generally popular sleep apps on the market, and we may be better able to retain our customers.

Operation plan

Part 1: Location and facility management

Location: we need to select a site in the software park for our software development room, where we will develop and experiment our applications. In addition, we also needed a studio to work together, where we would design the exterior of the software and the interior functions.

The choice of location should also consider the traffic conditions and the degree of industrial agglomeration. Transportation should be convenient, and there should be a parking lot, convenient for employees and visitors. The degree of industrial agglomeration should be high, and it is best to set up studios in software parks or high-tech industrial development zones, so as to enjoy convenient public equipment and reduce development costs. In addition, it can increase competition and stimulate innovation.

Facility: Infrastructure requirements for software development require development platforms, development environments, and development languages. Programmers need a development environment to develop new software in the practice process using development platforms, software tools, software development languages and databases.

In addition, it also needs to be equipped with water, electricity, Internet and other equipment. Special requirements for software development also require laptops and desktop computers.

Part 2: Key activities

In daily operations, programmers need to constantly research and develop programs, testing, maintain and update applications (key activities). The programmers also need to design the main interface and appearance of the application. At the end of software development and before the software enters the market, professional designers are required to design the application icon.

Other activities include routine equipment maintenance and studio cleaning. Software development and subsequent maintenance and upgrades need to be done by ourselves (keep-in-house). Software main interface and application icon design can be outsourced. Daily cleaning studio can also hire professional cleaning staff to complete.

Marketing plan

According to a report by Grand View Research (2023), the global sleep aids market size was valued at \$69.5 billion in 2020 and is expected to grow at a compound annual growth rate (CAGR) of 6.9% from 2021 to 2028. This indicates a significant potential market for sleep-related products. Our business especially focuses on college girls.

Target Segment

The target segment for our business would be college girl who have trouble sleeping or want to improve the quality of their sleep. This includes students with insomnia or other sleep disorders, as well as those who experience occasional unable to sleep and stay up late. There are 30% heavy users and 50% light users. And the rest 20% may be the problem users which may not find our app satisfied.

Market Strategy-4P Practice

The market strategy for a sleep-related app focus on the 4Ps: product, price, promotion, and place.

Product: The app should be designed to meet the needs of the college girls. The app should have fashionable but concise page design. And the function should be practical with high quality. This may include features such as sleep tracking, relaxation mode, or personalized sleep recommendations.

Price: The price should be competitive with other sleep-related products on the market. College girls are normally those who have no stable salary. So the average price should be relatively low than the competitors. Pricing strategies such as bundling and subscription-based models can also be introduced.

Promotion: The promotion should focus on reaching the college students through targeted advertising and social media campaigns. This may include partnering with influencers in the health and wellness space and offering discounts or promotions to new users. The promotion strategy should also focus on building brand awareness and trust. To promote the user's using quality, there will be limited ads displayed on the home page.

Place: The app should be available through multiple channels, including different application stores. The product should be easily accessible to the college girls. This should be chosen based on the preferences of them. Such as Apple store, Google store and so on.

9. Financial Plan

The financial plan for a sleep-related app should include an analysis of all expenses, the division of revenue, and the financial cost for start-up and operation. This can be broken down into several components:

Expenses: This includes the cost of app development, marketing, operations, and any other expenses associated with running the business. The expenses should be carefully analysed and budgeted to ensure that the business is financially sustainable. For our sleeping app, we need around a total of 500 thousand yuan (cash inflow), including the initial hardware fee and designing, maintenance fee, the salaries of researchers and advertising cost. Later for each month, there will be 50 thousand yuan cost for updating the app per month.

Revenue: Revenue can come from a variety of sources, including advertising revenue or subscription fees. The revenue streams should be carefully analysed to determine the most profitable sources of revenue. We estimate that there will be 100 thousand VIP users and the net earning will be 3.7 million yuan per month (cash outflow). For every VIP users, we may charge them 25 yuan per month. What's more, there

will be some advertisement profits, that's 100 thousand income per month. (25*100,000+12*100,000=3,700,000 RMB/ month) Start-up and Operation Costs: This includes the cost of developing and launching the app, as well as ongoing operational costs. The start-up and operation costs should be carefully analysed and budgeted to ensure that the business is financially sustainable.

Funding Sources: Funding sources for sleep-related

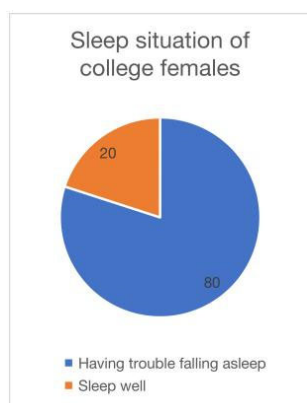
products can include angel investors, venture capitalists, and It is important to depend on the well-developed pitch and a solid business plan in order to attract potential investors. Additionally, non-profit organizations that support sleep-related research and development can offer some funds.

2.2. Figures

Per Year	
Direct costs (per unit)	RMB 500,000 (creating this software)
Costs for app upgrading	50,000 RMB per month 50,000* 12= 600,000 RMB
Expected sales	100,000 * 25= 2,500,000 RMB
Advertising profit	100,000 RMB per month 100,000*12=1,200,000 RMB
Full costs	500,000+ 600,000=1100,000 RMB
Market Expectation	Exceeds 100,000 people in following years
Revenue	2,500,000+1,200,000-1100,000= 2,600,000 RMB

*Direct costs includes the initial hardware fee and designing, maintenance fee, the salaries of researchers and advertising cost.

Figure 1. Financial Expenses



2.3. Journal style

Use American English when writing your paper. The serial comma should be used (“a, b, and c” not “a, b and c”). In American English, periods and commas are within quotation marks, like “this period.” Other punctuation is “outside”! The use of technical jargon, slang, and vague or informal English should be avoided. Generic technical terms should instead be used.

2.4. Acknowledgment

The “Acknowledgment” (no “s”) section appears immediately after the conclusion. If applicable, this is where you indicate funding for the work. The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Avoid expressions such as “One of us (S.B.A.) would like to thank ...” Instead, write “We thank ...” Sponsor and financial support acknowledgments are included in the acknowledgment section. For example: This work was supported in part by the U.S. Department of Commerce under Grant BS123456 (sponsor and financial support acknowledgment goes here). Researchers that contributed information or assistance to the article should also be acknowledged in this section. Also, if corresponding

authorship is noted in your paper it will be placed in the acknowledgment section. Note that the acknowledgment section is placed at the end of the paper before the reference section.

3. Literature References

References must be cited in the text within brackets in numerical order, starting with [1]. Do not use Word’s automated numbering features. Consecutive reference number citations should be indicated with an n-dash (–) [2–4] or a comma [5, 6] as necessary. In sentences, use the author names instead of “Reference [7]” or “as in [8]” (e.g., “Smith and Smith [9] show ...”).

The reference list must be typed in manually. Do not use Word’s References feature or numbered list. In the reference list, provide up to three authors’ names; if more than three authors, use “et al.” Place a space between an authors' initials. Papers that have not been published should be cited as “unpublished” [7]. Papers that have been submitted or accepted for publication should be cited as “submitted for publication” [8]. Please give affiliations and addresses for personal communications [9]. Use sentence case for the words in a paper title.

4. Conclusion

The manuscript should include a conclusion. In this section, summarize what was described in your paper. Future directions may also be included in this section. Authors are strongly encouraged not to reference multiple figures or tables in the conclusion; these should be referenced in the body of the paper.

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