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Commercial Application of Artificial Intelligence in Chinese Pan-mental Healthcare Industry

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Abstract: In the modern educational landscape, the mounting academic demands imposed on adolescents, coupled with a noticeable trend of enrolling children into formal schooling at increasingly younger ages, have become influential factors in the exacerbation of emotional stress experienced by young individuals. This burgeoning concern for mental health matters within contemporary society necessitates a heightened level of attention and thorough investigation. This comprehensive report unfolds as an intricate exploration of multifaceted dimensions. It begins with a meticulous literature review, which delves into the existing body of knowledge surrounding the issue. Subsequently, the report investigates the practical applications of AI in the domain of mental healthcare, recognizing the potential benefits and advancements AI technology can bring to the field. Moreover, an external analysis is conducted to contextualize the broader societal and environmental factors contributing to the observed challenges. A competitive landscape assessment is performed to understand the existing solutions and their strengths and weaknesses. Further, strategies related to market segmentation and targeting are formulated to better address the diverse needs of the audience. The report also provides a detailed description of the target customer base, offering insights into the demographics and psycho-graphics of the individuals who stand to benefit most from the proposed AI-driven solution. A mock product is meticulously designed, integrating the learning from the aforementioned analyses. Furthermore, conjoint analysis and data analysis techniques are applied to discern the nuanced preferences and needs of the target audience. The study, rooted in empirical research, investigates the intricate web of psychological challenges teenagers face in present-day society. In response to the identified issues, the report outlines the development of an AI-exclusive application. This application is thoughtfully tailored to ameliorate the mental health challenges specific to teenagers, offering a promising avenue for providing timely and effective support to this vulnerable demographic.

Keywords: pan-mental healthcare, AI, teenager.

1. Introduction

The Chinese mental healthcare service industry has experienced a robust upswing in its market dimensions, stimulated by the heightened significance attributed to mental health in the wake of the

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COVID-19 pandemic. The resultant surge in awareness has led to a pronounced demand-supply disparity, compelling the industry to seek novel strategies for expansion. A conspicuous trajectory in this pursuit is the transformation towards digitalized mental healthcare services, underpinned by the convergence of AI and machine learning technologies. Pioneering entities have proactively amalgamated AI language models and machine learning algorithms with mental healthcare paradigms, establishing a compelling premise for their applicability and viability.

Robotic Process Automation (RPA) technology is a pivotal contender in this paradigm shift, poised to discern and categorize patients' mental health issues. Subsequent routing of patients to human counselors and therapists through this technology promises augmented efficiency. Complementary to this, AI-driven psychological counselors manifest the capability to engage individuals grappling with depression through cognitive behavioral therapy (CBT) administered via conversational interactions. Notably, these AI counselors offer real-time and discreet support, fostering an environment conducive for discussing intimate concerns, thereby mitigating the stigma surrounding mental illnesses.

Prior endeavors in this domain have primarily concentrated on integrating AI within the realms of psychological therapy and counseling. However, a relatively modest emphasis has been placed on its broader application within the pan-mental healthcare service sector. This sector is projected to exhibit an impressive Compound Annual Growth Rate (CAGR) of 34.5% from 2020 to 2025. Notably catering to mild mental afflictions, this segment finds resonance with adolescents, who are susceptible to psychological challenges such as depression and anxiety, albeit with a limited propensity to invest substantially in therapy.

In the current study, the works' investigation centers on the infusion of AI technologies into the Chinese pan-mental healthcare service sector, underscored by an analysis of the prevailing market opportunities. Synthesizing insights from industry analyses conducted by consulting firms and mental health reports from China's Academy of Sciences, our methodology incorporates conjoint analysis of a mock product, the work design, and data mining techniques to derive primary market data. This lets us discern the pivotal attributes underpinning a successful pan-mental healthcare product. The result findings underscore the criticality of visual product design and AI's capacity to guide users in resolving enduring challenges. Targeting the adolescent demographic in the work, we ascertain their willingness to invest considerably in such services.

2. Literature Review

2.1. Research in incorporating Artificial Intelligence in mental healthcare

Artificial Intelligence's application in mental healthcare has long been a focal point for Western psychiatrists. To train AI models, supervised learning, a subset of machine learning, is employed to optimize the classification of mental health states or specific mental health behaviors. Additionally, unsupervised learning assists with data labeling and selecting effective features. Notably, Natural Language Processing (NLP), encompassing voice and text, applies unsupervised learning methods to evaluate human semantic sentiment by extracting keywords such as anxiety, depression, or stress [1]. Extensive research focusing on the specific application of AI has demonstrated that robotic process automation, rooted in artificial intelligence, can revolutionize psychological counseling, a pivotal component of mental healthcare. AI can effectively classify a patient's mental state and relay this information to human counterparts, significantly enhancing efficiency. This innovation enables online psychological counseling firms to automate their operations while preserving their core functions. Simultaneously, AI's interactivity and adaptability are enriched by data, allowing for further customization [2]. Concurrently with the advancement of AI, chatbots have emerged as a new focus within the realm of mental healthcare. Artificial intelligence empowers individuals to engage in conversations with robots, which are trained through machine learning to mirror human

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understanding and response patterns. In this context, AI is harnessed for natural language understanding, offering tailored advice based on specific user utterances and mental states. This approach has yielded benefits in psychoeducation and adherence [3]. For instance, empirical research by Iglesias et al. underscores the acceptability of Wysa, a chatbot, for psychosocial intervention, particularly among individuals seeking to reintegrate into the workforce.

2.2. Academic opinions toward the role of AI in mental healthcare

A series of recent studies have unequivocally demonstrated the effectiveness of artificial intelligence in the field of mental healthcare. According to research conducted by Avasthi, Sanwal, Sareen, and Agrawal in 2022, artificial intelligence and machine learning methods leverage electronic health records, mood rating scales, brain imaging, and mobile device monitoring data for predicting, classifying, and categorizing mental health issues. This extends to conditions primarily encompassing psychiatric illness, suicide attempts, schizophrenia, and depression. These methods aid in diagnosis and the customization of therapy for patients with varying degrees of mental illness [4].

Though resistance from organizational, individual, and technical levels challenges the implementation of AI in mental healthcare, the potential offered by AI solves some problems concerning the availability, attractiveness, and accessibility of mental healthcare. Artificial intelligence contributes to identifying the patients in most need of mental healthcare services. It determines the most suitable therapy for them while integrating reliable diagnosis, persisting monitoring, and talioring in the process [5].

As the research focusing on artificial intelligence in mental healthcare during the COVID-19 pandemic stresses, technologies like artificial intelligence played a significant role in mental healthcare during the Pandemic, which, to some extent, ensured the low- and middle-income countries in short of mental health resources could overcome the mental crisis [6]. Though the effectiveness of artificial intelligence in the mental healthcare field is accepted by many scholars, some scholars deem that some part of the utility of AI in mental healthcare is overstated, highlighting the drawbacks and limitations of AI in the industry. Regarding the increased usage of AI chatbots, Julia. E.H. Brown and Jodi Halpern published an article in SSM-Mental Health, claiming that AI chatbots cannot replace human interactions, albeit with all the potential benefits of AI. They assert three essential aspects of the therapy of human interaction are overlooked: treatment concerning an individual's lost self-motivation and self-advocacy capacity, embodied empathy in human therapists' non-verbal cues, and the social relationship provided by face-to-face interaction. Also, the implicit ethical problems of AI, chatbots-including disrespecting the patient, failing to show empathy, and disobeying the requirement of social justice-further illustrate the constraint of AI in mental healthcare [7]. From a more pessimistic perspective, Carlos Montemayor, Jodi Halpern, and Abrol Fairweather argue there are "principal obstacles" to the empathy of AI in clinical medicine that cannot be solved with any technical or theoretical approach. They believe human monitoring and intervention are necessary in such cases, with the risks of AI neglected [8].

2.3. The business application of AI in mental healthcare

As the mental healthcare market and technology about artificial intelligence continuously develop, many corporations saw the potential of AI in a mental healthcare business. Its feasibility has been illustrated by a lot of successful business applications. Numerous cases support the view that chatbots can find commercial viability in psychological counseling. Wysa, a chatbot application, successfully secured $5.5 million in funding for its A-round and an additional $20 million for its B-round [9]. Additionally, Youper, a widely used commercial mobile mental healthcare app that leverages artificial intelligence has proved to be effective and acceptable for paying Youper users. In the study,

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the paying users are asked to rate the app on a 5-star scale, and their data of usage is under the supervision of the researchers. As the study finds out, the rating is very high (mean 4.36 stars), and 42.66% of users are retained after 4 weeks [10]. Furthermore, the CEO of Scietrain, an AI language model company specializing in mental healthcare chatbots, maintains that mental healthcare will become an essential service in the future, with revenue generation posing no substantial challenge [11].

While substantial research and commercial efforts have been devoted to the development of advanced AI language models for use in psychological counseling, considerably less attention has been directed toward the application of AI models in the pan-mental healthcare industry. In accordance with the study conducted by Denecke, Vaaheesan, and Arulnathan in 2021, SERMO, a mobile application featuring an integrated chatbot and cognitive behavior therapy (CBT) techniques, functions as a comprehensive pan-mental healthcare service. In addition to chatbots, SERMO offers features such as emotion diaries, enjoyable activities, mindfulness exercises, and general information on emotions and CBT [12]. However, in light of heightened competition in this sector, a successful pan-mental healthcare service must incorporate AI across all aspects of its offerings while excelling in user interface (UI) design and long-term management. This strategy is vital for securing a substantial market share and fulfilling user needs with minimal reliance on AI or human professional psychological intervention. This study aims to analyze the existing pan-mental healthcare market in China and explore untapped customer segments in this industry by designing a mock product and conducting a conjoint analysis. Through our research, we intend to elucidate how to craft a winning product in this industry and identify its critical attributes.

3. Creating a Successful Pan-mental Healthcare Product

3.1. Analysis of the Chinese Pan-Mental Healthcare Market

3.1.1. Market Analysis

Aiming to get comprehensive information about the current situation of the market, our company uses several aspects to analyze the industry of mental health of teenagers. Utilizing the PESTAL model, we conduct an in-depth examination of the external market landscape through political, economic, social, and technological perspectives. From the political environment, the government has intensively emphasized the importance of promoting mental health services, 'Guidance of Strengthening Mental Health Services', spanning the years 2016 to 2023. The emergence of the COVID-19 pandemic further catalyzed attention towards mental health concerns, resulting in the formulation of a series of impactful national policies. After the outbreak of COVID-19, mental health issues have been paid more attention, and the national policy has continued to exert its strength, and an intensive series of policies have been pushed out. After that, with the continuous development of the domestic economic level in China, the per capita disposable income of residents has increased yearly. Per capita consumption expenditure is also rising year by year. As society increasingly emphasizes both physical and mental well-being, expenditure on medical care, including mental health services, experiences a corresponding uptrend. This trend is underpinned by an expanding ability among users to financially support mental health service products as consumers increasingly seek solace, mood enhancement, and peace of mind through consumption.

Third, from the social perspective, according to an investigation on the mental health status of urban residents in China, 73.6% of people live in a state of mental sub-health. Along with the spread of mental health information and the impact of the sudden COVID-19 pandemic in 2020, the public's attention to "mental health" has increased significantly compared with previous years, with 78.34% of respondents saying mental health issues are important. This growing societal consciousness

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translates into an increasing number of individuals proactively monitoring their mental health, thereby improving their recognition of and demand for mental health services. Lastly, the advent and widespread adoption of technological advancements, such as the Internet, big data, and artificial intelligence, have lent invaluable support to the development of online psychological service platforms. These technologies streamline the creation of such platforms, making them more convenient, efficient, and cost-effective. Consequently, various online psychological services can be offered through these platforms, catering to users across diverse geographical locations and time zones.

3.1.2. External Analysis

In recent years, there have been several apps focused on psychological problems in order to cope with the stress of people from the ages of eighteen to forty. Those apps that hold different characteristics and properties contribute to having higher differentiation and fitness of different customers' needs. For instance, Yi Psychology, an app focused on professional psychological consoling, serves the masses between twenty and forty. Also, Soul and 1.0 are apps that combine artificial intelligence and psychological counseling together and offer help to people. They have some services such as AI disabuse, a self-styled diary.' Yi Psychology' is a prominent domestic mental health service platform in China, boasting a robust developmental trajectory. The platform features a comprehensive product matrix designed around the multidimensional needs of its users. It has also established a multi-tiered consultant supply ecosystem through 'self-training deep cooperation.' Its offerings encompass various products, including community-based question-and-answer communities, meditation tools, psychological assessments, content-driven psychological courses, and training programs. Additionally, for individuals grappling with mental sub-health, the platform provides professional evaluations, online counseling sessions, and mental health consultations. 'Yi Psychology' boasts a cadre of over 1000 psychological counselors who offer their services to the public, as well as an extensive library of more than 200 paid psychology courses and over 250 original paid psychological assessments.

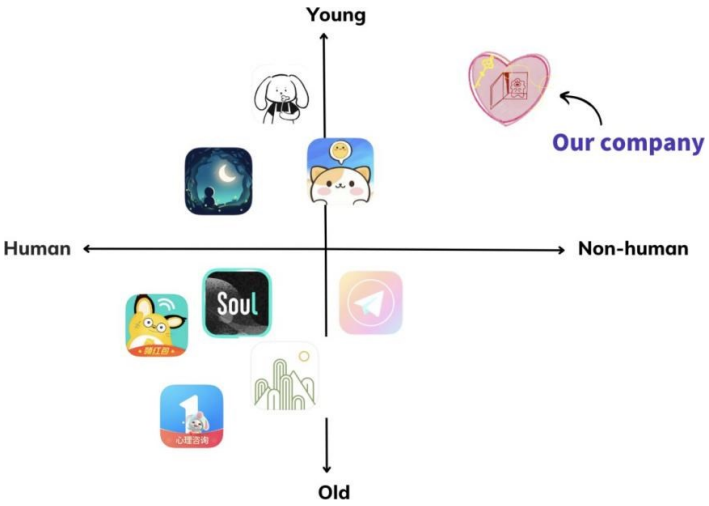

Figure 1: Perceptual map.

The perceptual map in Figure 1 shows the positioning of existing brands in the market of the mental health field. We separately use different measurements. The vertical measures the target customers' ages from young to old. The horizontal is categorized into 3 levels of operation and communication by humans, non-humans, or combined together.

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The reasons why we chose those two measurements are that they measure the most influential indicators in this industry. It definitely reveals a gap in introducing AI into the mental health field that contributes to resolving the problems of teenagers between the ages of fourteen and twenty.

To address this gap in the market, our company has embarked on developing a new application named 'Heartspace,' aimed at satisfying the unique needs of our customers. In our pursuit of establishing a robust customer base, we have devised a three-pronged strategy. Firstly, we have implemented a highly specific and accurate AI system capable of responding precisely to users' concerns. Secondly, we have meticulously designed and implemented a comprehensive privacy control system, ensuring the utmost protection of user data. Lastly, our differentiating factor lies in our long-term accompanying projects, which store and remember persistent worries, offering personalized solutions for each client.

Industry analysis of the market size of mental health services in China has drastically increased from 280 million yuan in 2015 to 2020 3.18 billion yuan annually, with a compound annual growth rate of 62.9%. According to Sullivan, the market size of China's pan-mental health services will reach 10.41 billion yuan in 2025, with a compound annual growth rate of 34.5. Presently, China's comprehensive mental health services market is in a phase of rapid development, yet it grapples with inherent challenges. Notable issues include service fragmentation and the absence of a systematic approach within the industry, with room for the development of industry-standard systems by enterprises. Anticipated future improvements in industry standards and digital technologies dedicated to comprehensive mental health services are expected to fuel continued rapid growth in this market. Furthermore, the current landscape underscores a growing trend where individuals, driven by advancements in technology and education, are increasingly inclined to seek assistance for psychological concerns. There is a notable uptick in consumer awareness regarding mental health. The proliferation of media and emerging technologies has empowered online comprehensive mental health service platforms to offer remote interactive capabilities, transcending temporal and spatial constraints to cater to a broad spectrum of needs.

The future outlook for the comprehensive mental health service industry appears promising on several fronts. Firstly, the global surge in mental health disorders, accelerated by the COVID-19 pandemic, has raised awareness and prompted the Chinese government to advocate for the specialization, standardization, and systematization of mental health services. This is in response to the historically low coverage of China's mental health service system. Chinese residents have transitioned from relying solely on self-regulation to actively seeking early intervention for mental health challenges, thus enhancing the recognition and popularity of comprehensive mental health services.

Secondly, a substantial demand base for mental health counseling exists in China, and this demand far exceeds the current supply within the industry. As the sector continues to standardize, efforts to cultivate mental health service consultants and develop digital psychological services are poised to alleviate the shortage of professional talent, thereby fostering remote service expansion.

Lastly, the overarching trajectory involves the convergence of psychology and technology. AI-driven psychological counselors, leveraging technologies like deep learning, intelligent interaction, sentiment analysis, and robotic process automation (RPA), are progressively supplanting traditional mental health service models, representing a dynamic shift in the industry's landscape. In summary, the comprehensive mental health service sector in China is experiencing rapid growth, driven by evolving consumer needs, advancing technology, and heightened awareness. As the industry matures, it holds the potential to bridge existing gaps in mental health support and revolutionize the way mental health services are delivered.

After that, with the continuous development of the domestic economic level in China, the per capita disposable income of residents has increased yearly. Per capita consumption expenditure is

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also rising year by year. As people pay more and more attention to physical and mental health, the per capita expenditure on medical care is also on the rise. For mental health service products, the user's ability to pay has a certain economic basis. With the increasing attention to the needs of the psychological level, the enjoyment consumption for the purpose of reducing worries, and pleasing mood is increasing.

Third, from the social perspective, according to an investigation on the mental health status of urban residents in China, 73.6% of people live in a state of mental sub-health. Along with the spread of mental health information and the impact of the sudden COVID-19 pandemic in 2020, the public's attention to "mental health" has increased significantly compared with previous years, with 78.34% of respondents saying mental health issues are important. An increasing number of people are paying attention to their mental health status, and the cognition of mental health services is gradually improving, and the potential demand for the mental health services market is increasing day by day. Last but not least, with the maturity and wide application of the Internet, big data, artificial intelligence, and other technologies, it provides technical support for the mode of Internet psychological service platform, which makes the construction of Internet psychological service platform more convenient and efficient, and effectively reduces the research and development cost. More different forms of online psychological services can be provided on the platform to meet users' needs across regions, time, and space.

3.2. Competition landscape.

3.2.1. Segmentation and Targeting

After analyzing the products available in the market, we found that the mental health of all of us is a great concern in today's society. Richard A. Friedman, M.D., published an article in NEJM Volume on December 28, supporting this view. In Dr. Friedman's scholarly exposition, he convincingly points to a disturbing statistic that underscores the gravity of the situation: About half of all people with mental health disorders present before the age of 14 [13]. This disturbing trend demonstrates the urgent need for early intervention and support in addressing mental health challenges, especially among adolescents. Additionally, the fact that suicide is one of the three leading causes of death among American teens is disheartening. This sobering statistic underscores not only the importance of addressing mental health issues among young people but also the horrific consequences of inaction, as evidenced by the tragic loss of life among American adolescents. The profound impact of mental health disorders manifests itself during adolescence, coupled with the alarming rate of untreated cases and the tragic epidemic of suicide among American teens. Since the CEO and management of the company are Chinese, the company's target market is Chinese teens between the ages of 14 and 20.

3.2.2. Description of customers

Today, teenagers are under increasing pressure to go to school, and kids are maturing earlier and earlier, which is causing some stress on the emotional front. There is a gap in addressing teenagers from 14 to 20 years old. Through our segmentation and targeting, the main needs of 14 - 20-year-old teens are avenues to express their emotions and voice their worries. Most of them may be introverted and struggle to talk deeply with friends or family. They may have difficulties in school or work or even have serious psychological problems. Because they need a way to express themselves, they can also get feedback and active listening from others who look like artificially intelligent robots. In addition, teens may not have a complete basic perspective and are exploring their own ways to relieve stress and recharge their batteries.

Psychosomatic issues can be categorized into many parts. For example, recognizing obstacles in their path. There is a lot of pressure on 14-18-year-olds to go to school, and much of this pressure

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comes from the stereotype that most people believe studying is the cornerstone of success. Kids from average families who want to be different have only one way out: study. Rich kids who don't study well have to follow the path paved by their parents. In this way, there is no way for them to realize their ambitions and dreams [14]. They may feel anxious about their parents' expectations of them.

Furthermore, in today's digital environment, it is clear that today's teenagers have developed a deep dependence on the Internet and electronic devices. This dependence is profound. While these technological advances have undoubtedly enriched their lives in many ways, this dependence has its drawbacks. One of the most obvious consequences of this dependence is the emergence of conflicts and tensions between teens and their parents. These conflicts often stem from a generational gap in understanding the role of technology in everyday life. Parents who grew up in different generations may view too much screen time as harmful to their children's development and well-being. They may worry about the impact of social media on their teen's self-esteem or the potential dangers of unrestricted Internet access. Conversely, teens often feel that their parents are out of touch with the digital world they inhabit. They may feel that their parents don't really understand the importance of online communication, gaming, or social media in their lives. In addition, the Internet has created a culture of comparison and vanity among teens. Social media platforms, particularly, are hotbeds for displaying a carefully curated version of one's life, complete with filters and carefully selected moments. This constant exposure to idealized images and lifestyles fosters a sense of inadequacy and a relentless pursuit of one's own approval through likes, comments, and followers. As a result, this phenomenon not only strains adolescents' relationships with their parents but also with their peers as adolescents grapple with self-esteem issues and competition driven by the online world. Therefore, we believe that since adolescents are more dependent on the Internet, it is important to develop apps that use AI to help adolescents solve psychological problems.

Furthermore, adolescents may have poor relationships with those around them. This is mainly found among girls, and it is known that relationships among girls may be more complex than those among boys [15]. Firstly, girls are more emotionally sensitive and expressive than boys. They are usually more attuned to their own emotions and those of their peers, which may lead to higher emotional experiences in relationships. This emotional sensitivity can create deeper connections and more significant conflict as they grapple with the nuances of feelings and interactions.

Second, girls typically place a strong emphasis on the importance of relationships in their lives. They tend to invest much time and energy in building and maintaining connections with friends, family, and lovers. This heightened focus on relationships can lead to both positive and negative outcomes. On the positive side, it can foster strong, lasting friendships and feelings of loyalty and support. However, on the negative side, it can also make girls more vulnerable to the ups and downs of relationships, as they may invest a great deal of their self-worth and identity in them. Another aspect to consider is

the challenge of communication. Adolescence is a time of rapid emotional development and self-discovery, making it challenging for teens, including girls, to express their feelings and concerns. They may find it difficult to openly discuss their feelings with those around them for fear of being judged or misunderstood. This reluctance to communicate can lead to internalized stress and may exacerbate relationship problems. For teens, there is a great need to have a place in their lives where they can talk about their emotions.

Both of these stressors make it difficult for them to control their emotions. When individuals struggle with emotional turmoil or challenging situations, a range of distressing behaviors and emotions may manifest. One common reaction is depression, a deep and pervasive sense of sadness and despair that can consume a person's thoughts and actions. In this case, individuals may withdraw from their daily activities, experience difficulty sleeping, and lose interest in what they once enjoyed. This emotional burden can be overwhelming and affect not only their mental health but their physical

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health as well. Additionally, when individuals are unable to effectively cope with their pain, they may resort to self-harming behaviors as a misguided way of coping with their emotional pain. In addition to hurting themselves, emotionally disturbed individuals may express their inner turmoil through verbal outbursts or saying things that hurt those around them. These

verbal attacks may stem from their frustration, anger, or feelings of powerlessness, and they can strain relationships and exacerbate an individual's sense of isolation.

3.3. Simulation Study of the Winning Product Design in the Chinese Pan-Mental Healthcare Market

Based on the analysis of the Chinese Pan-mental Healthcare Market, we examined the main competitors in the industry so as to determine the significant attributes that affect consumer purchasing behavior. In order to show the exact effects of the defining attributes, we designed a winning mock product that possessed different values from the existing products in the specific features and did a choice-based-conjoint analysis concerning our product and others. Finally, we used SPSS to use the logistic regression model to evaluate each attribute's effect and study the pricing under the optimal combination of attributes.

3.4. Defining the Significant Attribute

In this section, we reviewed the products of the main competitors in the field in terms of the differences between them and the competitors, including Yi Psychology, Heart Island Diary, Soul, Pine Cone Consulting, Simple Psychology, and Eclipse. Also, we examined the comments by the users, extracted the main features that make them feel good or bad, and ranked those features. As a result, the top two influential features we found were the visual interaction and the functionality of mental healthcare. According to the analysis of visual interaction conducted by Chinese researcher Yang Wang and Yan Zhang, visual balance has an important potential effect on the attractiveness of an app's guide page [16]; also, Zhang Zhang and Yilian Hao showed the visual interaction design can convey the emotional theme and satisfy user's unique emotional appeal in different scenarios [17], which provides cognitive psychological evidence of the attribute we found. For the functionality of mental healthcare, we assume it's significant based on the fact that people comment about the effects of mental products and the discussion related to the topic. To prepare for conjoint analysis, we rate each competitor's attributes of functionality and visual interaction from 1 to 10 according to the perception of users and an objective review. For instance, Counseling platforms like Yi Psychology have high functionality, referring to their effectiveness in solving convoluted psychological issues. Products like Heart Island Diary pay more attention to its anime design than its profession and validity.

3.5. Design a mock product

To examine the effect of attributes and design a winning product, our mock product targets teenage customers aged between 14 and 20 who aren't served by a substantial number of products. For the visual interaction, we design a visual interface catering to teenager's preferences. And being innovative. First of all, we provide a warm object to store customers' concerns. Artistic warm objects, capable of DIY unique design and dynamic design, can create good visual effects that soothe the user. In terms of functionality, based on cognitive behavior therapy, we provide a set of functions that incorporate AI language models. Firstly, we have a "me" profile and a list of questions about the user himself, which is created by machine learning, aiming to form a profile of the user's self-perception. Then, we have AI listeners in the emotional diary, which are patient and empathetic. The user can write down the bad mood in a diary with cute and warm figures. Then, the AI listener will analyze it, actively listening and providing potential suggestions. Not only can it give customers mental support,

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but it also records the bad mood of the user. The mood will be substantialized into an object that can be placed in an interactive space, aiming to create a mental space that strengthens the user's self-perception and provides mental comfort when the user respects. An AI-powered steward can "remember" each mood this app receives and gives the user behavioral advice about his life with a deep understanding of the user himself and the environment around him, providing available long-term guidance that can adjust the user's perception so that it solves mental issues. Additionally, we have meditation and white noise as a method of therapy.

3.6. Conjoint Analysis

3.6.1. Rating of the attributes

In order to study this market and target group, we conducted a conjoint analysis comparing our mock product and the other two main products–Yi Psychology and Heart Island. Firstly, we quantified the attributes of three products: the rating of functionality is 5 for Heart Island Diary and 10 for Yi Psychology; the rating for visual interaction is 4 for Heart Island Diary and 2 for Yi Psychology; the rating of functionality and visual interaction of our product both ranges from 4-6. The monthly price of Heart Island is 30 RMB, and the price of Yi Psychology is about 800 RMB (depending on the number of consultations per month). The monthly fee of our product ranges from 9.9RMB to 89.9 RMB (which we assume exceeds the potential perceived value) and adds 5 RMB each time we change it.

3.6.2. Design a stimulus format (manually)

To research the specified two features, we use partial profile stimuli, which show a subset of all the attributes of the product we study. Concerning the first two attributes, it's a two-attribute conjoint study with three levels each [32], so we listed all the nine possible combinations of our product and matched each combination with 15 different prices. The price range of each combination is determined by the overall level of the features. For instance, the combination of 6 in functionality and 6 in visual interaction had the lowest price of 40.9 RMB. In comparison, the combination of 4 in functionality and 4 in visual interaction had the lowest price of only 9.9 RMB.

3.6.3. Testing Process

The conjoint analysis process involved a total of 25 participants, comprising both high-school students and college students, with a gender distribution of 8 males and 17 females. The study encompassed the presentation of 370 distinct stimuli, eliciting 370 corresponding responses from the participants. Prior to the commencement of the analysis, participants were duly informed of the task at hand. Specifically, they were instructed to select their preferred product from a choice of three options presented in a table. Their selections were to be made based on a combination of three attributes, and they were explicitly directed not to engage in discussions with fellow participants during the evaluation process. To facilitate a comprehensive understanding of the attributes, the researchers meticulously detailed and explained the functional and visual aspects of each attribute level. Regarding functionality, Level 4 of the product exclusively featured AI listeners with capabilities akin to those exhibited by the GPT-4 model. In contrast, Level 5 incorporated not only the same AI listener but also an emotional diary. Level 6 extended these functionalities further, encompassing the AI listener, emotional diary, and meditation support supplemented by white noise. Regarding visual interaction, Level 4 boasted a warm and aesthetically pleasing design. Level 5 retained this design while also affording users the ability to customize it according to their preferences.

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Meanwhile, Level 6 offered the same design, customization capabilities, and dynamic elements, wherein the graphical components within the design possessed the capacity to move.

3.6.4. Data Analysis

Upon completing the testing phase, the collected data were meticulously entered into the Statistical Package for the Social Sciences (SPSS). Subsequently, a logistic regression model was employed to conduct a rigorous and systematic analysis of the dataset. The dataset was comprised of 3 main attributes that we intended to study –functionality, visual interaction, and price. Nevertheless, since the other two products were far more popular and famous compared with the mock product we designed, we added the brand as a categorical variable to better fit the testers' decision-making process. Firstly, before analyzing the correlation between the attributes and the decision, we first tested the goodness for fit by the Hosmer Lemeshow test, as shown in Table 1.

Table 1: Hosmer and Lemeshow Test.

HOSMER AND LEMESHOW TEST			
STEP	CHI-SQUARE	DF	SIG.
1	7.459	4	0.114

The significance of the test was 0.114, exceeding the threshold of 0.05, affirming the model's degree of fit. Then, we test the validity of the model by ominous test in Table 2.

Table 2: Ominous Test.

Likelihood ratio chi-square value	P	AIC	BIC
794.902	0.000***	808.902	843.618
Note: ***, ****, * represent the significance levels of 1%, 5% and 10%, respectively			

In the test, the p-value was close to zero, which showed a high significance level and confirmed the model was valid. Finally, we test the accuracy of the model, which was showed to be 0.812– though limited by the sample, the model can still predict consumer purchasing behavior to some extent. Secondly, we analyzed the coefficients of the attributes, as shown in Table 3. The significance analysis reveals important insights into the impact of various factors on the selection process. Firstly, the constant exhibits horizontal significance with a P value of 0.036**, indicating that it significantly affects the selection. For each additional unit of the constant, the probability of choosing 1.0 decreases by 0.0% compared to the probability of 96.842. Similarly, the functional factor demonstrates significance at the level, with a P value of 0.007***, implying a substantial influence on the selection. Each additional unit of the function increases the probability of choosing 1.0 by 0.0% compared to 74.556. Additionally, the price variable (P value: 0.000***) and visual design (P value: 0.000***) both display significant impacts on the selection, with the price reducing the probability of choosing 1.0 by 0.0% per unit, compared to 6.278, and visual design increasing it by 0.0% per unit, compared to 111.234. Brand-Heartspace and Brand-Heart Island Diary also show substantial significance, influencing the selection process significantly, with probabilities differing from 323.198 and 71.789, respectively. In contrast, Brand-One Psychology does not exhibit significance, as its P value is 1.000, indicating no significant impact on the choice.

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Table 3: Significance analysis.

Experimental group = 1.0	Regression coefficient	standard error	Forest	P	OR	OR value 95% confidence interval	
						upper limit	lower limit
constant	-3.455	1.648	4.394	0.036**	0.032	0.001	0.799
function	0.557	0.208	7.164	0.007***	1.746	1.161	2.625
Price	-0.065	0.008	68.036	0.000***	0.937	0.923	0.952
Visual design	0.748	0.185	16.311	0.000***	2.112	1.469	3.037
Brand _heartspace	1.443	0.317	20.693	0.000***	4.232	2.273	7.88
Brand_One Psychology	-514.765	6.705954599201753 e+111	0	1.000	0	0	
Brand_Heart Island Diary	-1.265	0.278	20.782	0.000***	0.282	0.164	0.486
Dependent variable: Select							

Note: ***, ****, * represent the significance levels of 1%, 5% and 10%, respectively

According to the regression model results, the influence of functionality on product selection is less significant than we thought. Conversely, visual design plays an important role in determining the success of a pan-mental healthcare product in the market. To estimate the market demand curve for the mock product, we employed a logistic regression equation to calculate the likelihood of selecting the mock product across different price points under a specified attribute combination with the coefficient shown in the model result. We then multiplied this likelihood by the potential market size to ascertain customer quantity. With customer quantity at each price point, we then calculated revenue and profit figures.

Eventually, we calculated that the mock product could make the most revenue at a price of 70 when the functionality and visual interaction were both in level 6. The market demand curve was sketched. The analysis reveals that our high-profit potential, which underscores the willingness of teenagers in the underserved pan-mental healthcare market to pay a premium for a well-designed AI-powered product. For new entrants seeking to combine their products with AI language models within the pan-mental healthcare market, consideration should be given to integrating artificial intelligence and cognitive behavioral therapy to establish a comprehensive and effective therapeutic system. This approach can cultivate long-term loyalty among users. However, our research also underscores the critical importance of interface design and visual appeal, as these factors significantly influence the acquisition of new customers and market share during the introductory phase. Marketing officials can set relatively high prices, as indicated by the mock product's high perceived value among customers, thereby allowing for ample profit margins.

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4. Conclusion

In conclusion, this comprehensive study delves into integrating AI technologies within the broad spectrum of mental health care, with a particular focus on adolescents aged 14 to 20 years. The backdrop against which this research unfolds is the escalating significance of mental health issues, especially in the aftermath of the COVID-19 pandemic, which has underscored the imperative for innovative solutions to address the mental well-being of this vulnerable demographic. This innovative approach harnesses a combination of advanced analytics, data mining techniques, and insights from the mental health industry to meticulously discern the pivotal attributes that underlie successful products and services in this sector. The findings emanating from this study serve as a beacon, illuminating a conspicuous gap in the market, a niche where pure AI applications tailored explicitly for teenagers remain conspicuously absent. While existing competitors predominantly cater to a more diverse age range, there exists a discernible void when it comes to AI-powered services custom-tailored to the unique needs and preferences of this age group. This presents a distinctive opportunity for companies to pioneer the development of groundbreaking products aimed squarely at adolescents grappling with mental health challenges.

Creating a winning product that resonates with this age cohort necessitates a multifaceted strategy. Companies should not only seamlessly integrate cognitive behavioral therapy principles and state-of-the-art artificial intelligence into every facet of their offerings but also allocate significant resources to crafting visually engaging interfaces that resonate with adolescents. The receptiveness of young individuals to embrace and invest in pan-mental health services provides ample leeway for businesses to potentially achieve higher profit margins while fulfilling a vital societal need. As we gaze into the horizon of possibilities, the potential of AI in the realm of mental health care appears extraordinarily promising. It holds the trans-formative power to revolutionize mental health support for the younger generation, offering readily accessible and stigma-free assistance. Anticipating the future, further research endeavors may explore more advanced mood analysis techniques and personalized intervention methods, ushering in a new era of truly personalized pan-psychological medicine. This trajectory offers the hope of a brighter future where technology seamlessly intersects with the compassionate care needed to bolster the mental well-being of adolescents and, ultimately, the broader population.

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