# Analysis and segmentation of market gadgets for a better night's sleep
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**Abstract**

The relevance of this article is that in the 21st century the sleep problem is becoming more and more serious. Requirements for professional qualities are constantly growing, thus, the level of stress is constantly increasing, the speed of life is developing and this unambiguously leads to sleep disturbance.

Analyzing the market for sleep gadgets, it has been decided to select the three most popular applications for research: Runtastic Sleep Better, Sleep As Android, Sleep Cycle.

Having analyzed the use of trackers for improving sleep quality, it has been found that 16% of respondents have tried sleep trackers and are ready to explore their sleep with other applications, 34% of respondents are going to try sleep trackers, 35% of respondents have doubts about these gadgets, and 15 % of respondents refuse to use gadgets.

According to the application users, three main segments are identified: people who are not getting enough sleep, professional athletes and people building a career.

*Keywords:* Segmentation, market gadgets for sleep,

## 1. Introduction

The relevance of this article is explained by the fact that in the 21st century the problem of sleep is becoming more serious. Requirements for professional qualities are constantly growing, because the level of stress is constantly increasing, the speed of life is developing and this unambiguously leads to sleep disturbance.

This behavior can be improved through interventions that include education, goal setting, self-monitoring and feedback strategies [1].

The goal of the paper is to study the gadget market and to identify potential consumers for them. The goods are specific and for the determination of the product it is necessary to study it in details.

The main objectives of the study are:
• studying the physiological features of sleep;
• understanding the causes of sleep disorders;
• researching the market of sleep gadgets;
• drawing up portraits of potential consumers for sleep gadgets.

This field allows us to think about the factors that affect sleep and help to find the best solution in the field of gadgets sleep.

## 2. Discussion

It is important to understand the basic concepts needed for further research of sleep disorders. Sleep (Latin "*somnus*") is a natural physiological process of being in a state with a minimum level of a cerebral activity and a reduced response to the surrounding world, inherent in mammals, birds, fish and some other animals, including insects (e.g., fruit fly). In a dream, the level of anabolic processes rises and catabolism decreases. Sleep normally occurs cyclically, approximately every 24 hours. These cycles are called circadian rhythms. They are redefined every 24 hours; the most important factor is the lighting level.

Sleep, a special state of consciousness of man and animals, includes a number of stages, regularly repeating during the night (with a normal daily chart). The appearance of these stages is due to the activity of various brain structures.

If we examine a healthy person, his/her sleep begins with the first stage of a slow sleep, which lasts 5-10 minutes. Then the second stage, which lasts about 20 minutes, comes. The other period of 30-45 minutes falls on the period of $3^d$-$4^{th}$ stages. After that, the sleeper returns to the second stage of a slow sleep, after which the first episode of a fast sleep occurs, which has a short duration - about 5 minutes. The whole sequence is called a cycle. The first cycle has a duration of 90-100 minutes. Then cycles are repeated, while the proportion of slow sleep decreases, and the proportion of fast sleep (REM-sleep) gradually increases, the last episode in some cases can reach an hour. On average, with a full healthy dream, there are five complete cycles.

Sleep performs the following functions:
1)   sleep provides rest to the body;
2)   sleep contributes to the assimilation of the information studied;
3)   sleep adapts the body to changing light from day to night;
4)   sleep helps to restore immunity by activating T-lymphocytes that fight against cold and viral diseases.

Sleep disorders are a common problem in the modern world; full of stressful situations, hard work, a lot of temptations and excesses combined with a sedentary lifestyle and poor ecology. Physical activity and sleep are important for the promotion of health and well-being [1, 2, 3]. Insufficient moderate-to-vigorous intensity of physical activity, prolonged sedentary behaviour, and poor sleep behaviours - sleeping, too few / many hours or having poor quality of sleep, CVD, type 2 diabetes, poor quality of life, anxiety, depressive symptoms cause mortality [2,3, 4, 5, 6, 7]. Internationally, significant proportions of the adult population report in one or more of these health-compromising behaviours [8, 9, 10, 11, 12, 13].

Sleep disorders cause fatigue, weakness, excitability, inhibition of motor functions, impaired ability to concentrate. Modern science has convincingly shown that sleep is an active, complex, multifunctional process. The study of sleep with various disorders of sleep leads to the allocation of a new section of medicine - sleep medicine or, as it is also called *somnology* - the science of sleep.

Currently, 8 to 15% of the adult population of the world have frequent or persistent complaints of poor or insufficient sleep, 9 to 11% of adults use sedative hypnotics, and the percentage of older people is significantly higher.

Sleep disorders can be at any age. Some of them are more typical for certain age groups, for example bedwetting, nighttime fears and somnambulism for children and adolescents, as well as insomnia or pathological drowsiness for middle-aged and older people. Other disorders, such as narcolepsy-cataplexy syndrome, can be the problem of children and can exist whole life.

The application "Sleep Cycle" conducted a very unusual study. It compared the quantity, quality and even mood of people's sleep in different countries.

Researchers have received the data about sleep based on the performance of a special application for smartphones. It is used by 941 300 people aged 18 to 55 years old.

having analyzed the results, the researchers conclude that the best quality of sleep can be observed in such countries as:

1st place - Slovakia;

2nd place - China;

3rd place - Hungary;

4th place – the Czech Republic;

5th place - Poland.

Russia is on the 11th place. At the end of the TOP-50 list are Great Britain, Saudi Arabia, Australia, New Zealand, the USA, Ireland and Malaysia. The data is published by the Daily Mail.

Only 25% of people sleep eight hours a night, as doctors recommend and children go to bed later. The head of the Evangelismos hospital in Athens, Manos Vagiakis, said that in 1980, 45% of people slept at least eight hours a day. Now about 15% of people have sleep problems.

One of the key problems is that children (76% of boys and 64% of girls under the age of 15) go to bed after 23:00. Experts argue that the greater the amount of information is received, the more sleep a person needs and it is important to go to bed earlier, as one hour of sleep until midnight in its value is equal to 2-3 hours of sleep after 12a.m.

Taking into account the given data, as well as the fact that this problem is becoming ubiquitous, the demand for creating products for solving sleeping problems is growing. To solve the problem of poor and unstable sleep, a sleep tracker have been invented. Sleep Trackers are applications for modern smartphones that help to wake up much easier. Dream trackers are taught to wake up and go to bed on time, they help to fight with snoring and with a "crumpled look" in the morning. Some gadgets have the function of tracking the impact of the environment on a sleeping user.

The main advantage of sleep trackers is that they constantly analyze the quality of sleep. This is important because it is not easy to close eyes and go to bed; our brain turns off unconsciously. There are two stages of sleep: deep sleep and active sleep. During a deep sleep our brain really turns off, and our body and our brains have a rest. When we toss and turn in a dream, we wake up, our brains practically have no rest, it is an active stage of sleep, and it is less useful.

The most advanced sleep trackers provide users with a daily report on how they spent the night, how many hours are valuable, and how much hours are wasted. Gadgets also help to find out the cause of these problems. For example, the cause of poor sleep can be explained by: a glass of beer before going to bed, working at a computer late, noisy neighbors, etc.

The creators of applications for smartphones consider that any phone can be turned into a simple sensor of sleep. Today, the Apple Store and Android Market offer approximately 50 applications, and most of them are good, and they use accelerometers built into smartphones.

It is necessary to place a smartphone, with an installed application, on a pillow near sleeping person's head. The built-in motion sensor can analyze all movements at night and distinguish the deep stage of sleep from the active one.

However, like any other systems they have their shortcomings. First, the sensors of all three applications fail if there is another person or cat in bed. Second, the phone must be connected to the charger for the whole night, otherwise in the morning you can find 80-40% of the battery charge. Third, there is still electromagnetism. A questionable pleasure when a smartphone is next to your head all night, if you live in a world of high-tech devices. However, there are benefits. Users note that in all three applications, the smart alarm option is a priority.

At the moment, the most popular trackers are Fitbit and Jawbone. There are many different gadgets for the analysis of sleep: the Tranquil Moments Advanced Sleep Sounds alarm clock, the

Good Night electric lamp, the LIFX LED lamp, the WithingsAura smart system, the Remee Dream Mask, the cold cushion "SoothSoft Chillow".

*Alarm clock "Tranquil Moments Advanced Sleep Sounds".* Unlike a normal alarm clock whose main task is to wake a person, this device has an inverse function. This gadget is located on the bedside table and has sixteen sound programs for complete relaxation and effective sleep. The secret of sound tracks that includes the noise of a waterfall, ocean, wind, and many others is that they act on brain waves corresponding to different stages of sleep. If a clock should be prevented from working all night, there is an auto shut-off system after 15, 30, 60 or 90 minutes.

*Electric lamp "Good Night".* Any bright lights (especially artificial lighting) remind the brain of daylight, and the excessive amount of such light interferes with the production of melatonin, a hormone that regulates sleep. The Good Night LED lamp emits less blue light (compared to conventional light bulbs), which helps to prepare the brain for sleep. Initially, this device was designed for NASA astronauts, and now anyone can get it. Manufacturers guarantee that the life of such a lamp is at least 5 years.

*LED lamp "LIFX".* This is an advanced LED light bulb controlled over Wi-Fi. Connecting to a router, Android-devices or iOS-devices allow you to adjust the lighting without touching the switch. Several light modes help to adjust the body to the desired mode: light purple slows the heart rate and leads to relaxation, deep red promotes going to sleep, and orange - easy awakening. Also with the help of the application you can adjust the gradual intensification of the light in mornings and the slow fading of the light in the evenings helps the body to adjust to this or that time of a day.

*Smart system "WithingsAura".* This gadget is a night lamp with a speaker and an alarm clock and a special rug that is placed under the sheet. Sensors on the rug track the sleep phases by fixing motion, breathing and heart rhythms. The lamp responds to these indicators, which apply the appropriate lighting and include sounds that are optimal for a particular phase of sleep. The uniqueness of this gadget is that it not only captures and stores data, but also affects the owner's dream.

*Mask for conscious dreams - "Remee Dream Mask".* A sleeping mask with a built-in accelerometer is an ideal finding for those who suffer from nightmares. This device determines the phase of fast sleep when we usually see dreams. The manufacturer believes that after a few trainings the owner of this mask is able to perceive these signals without waking up.

*Cold pillow "SoothSoft Chillow".* Fans of sleeping who want to have fresh air no longer need to turn the pillow under their head every time – there is Chillow Pillow, which maintains a set temperature. It is known that ideal conditions for sleeping are when an air temperature is 16 - 19 degrees Celsius; so a simple device, like a cool pillow, can qualitatively improve sleep. In addition, the gadget is equipped with a speaker, which allows you to customize the pleasant sounds for sleep. In the updated version of the gadget, the producers promise to add a sleep phase analyzer and a vibrator alarm clock.

Analyzing the market for sleep gadgets, it is decided to select the three most popular applications for research: Runtastic Sleep Better, Sleep As Android, Sleep Cycle (See Table 1).

Table 1. Characteristics of sleep trackers

| Tracker name | Analysis of bad habits | Analysis of sleep | Additional options | Rating |
| --- | --- | --- | --- | --- |

| | | | | |
|---|---|---|---|---|
| 1. Runtastic Sleep Better | Explores how alcohol, coffee and training affect the quality of sleep. | Identifies the pattern: how the way of life affects the quality of sleep. | 1. Follows the phases of the moon. 2. You can keep a dream diary. | 4 |
| 2. Sleep As Android | | Keeps a record of sleep. | 1. There is a function: to share your dream report on social networks. 2.Tracking your snoring and compatible with smart watch Pebble Smart watch. 3. There are sounds of nature for falling asleep 4. You need to solve the task to turn off the alarm. | 4 |
| 3. Sleep Cycle | Explores how alcohol, coffee and training affect the quality of sleep. | Analyzes the dream. | 1. You can keep a dream diary. 2. Option to record "night sounds". 3. Smart alarm clock. | 4,5 |

The first tracker of sleep – *Runtastic Sleep Better* explores how alcohol, coffee and training affect the quality of sleep. Every day the user writes down everything he does during the day, the application processes these data and reveals the pattern of how the lifestyle affects the quality of sleep. The program tracks the lunar phase and gives advice on when to go to sleep. You can also keep a dream diary. This function is created especially for those who can not remember their dreams, and because of this he/she is very upset. The app has a trial version and premium, and its average rating is 4.0.
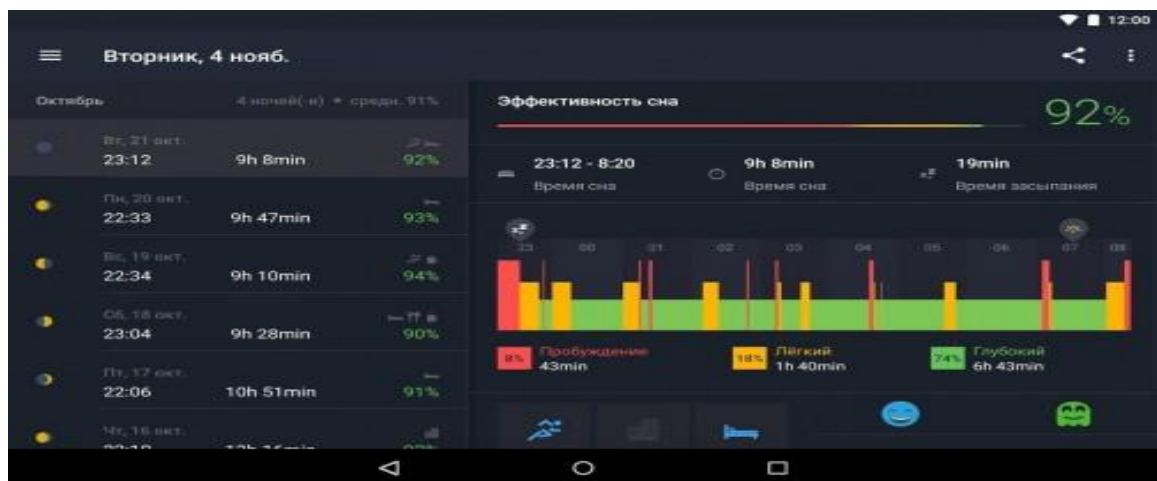


Figure 1. Appendix Runtastic Sleep Better

The second sleep tracker – *Sleep As Android* has the same user's rate of 4.0, although its developers adhered to a few other creative ideas. The way to turn off the alarm is quite interesting, the most lazy and sleepy users need to solve a math problem, count the sheep or take a picture of the QR code, which should be as far from the bed as possible to disable the alarm clock. Connect the headphones and enjoy the sounds of music until you go to sleep. *Sleep As Android* gives you an opportunity to share your dream report on social networks, the app tracks your snoring and is compatible with smart watch Pebble Smart watch.



Figure 2. Application Sleep As Android

The third tracker of sleep - *Sleep Cycle* is another application. It will cost a dollar, it is much less than the price of its competitors. On Google Play, users rate the application quite high (4.5 stars). In addition to a smart alarm clock and sleep analysis, there is still the option of recording "night sounds". This feature helps to distinguish snoring from cat purring, and the sound of a truck rides along the street, from the ringing of a doorbell. The application has all the same functions as the other trackers. You can keep a dream diary; the app evaluates the effect of coffee and your diet on sleep. Although, it does not follow the phases of the moon, as the application Runtastic.



Figure 3. Application Sleep As Android

So, who is the main target audience of these applications today? According to the users of applications, three main segments are identified:

First, people who are not getting enough sleep. In the USA only 70% of the population (224 million people) suffer from lack of sleep. Approximately the same percentage of the population suffers from the lack of sleep in other countries, which are the "leaders" among others by the average number of hours people sleep. A huge part of these people is ready to take control over their sleep with the help of a dream tracker.

Second, every year the world of professional achievements tries to set new records. Moreover, the speed of life affects the athletes themselves - constant fees, long flights, new time zones. In addition, any ambitious athlete is looking for the ways to improve their performance. More and more athletes have begun to think about maintaining their health and active healthy life after retirement. No professional athlete can do without a coach. However, how can a coach monitor each athlete how well he gets enough sleep and takes control of his/her sleep? A sleep tracker can be an excellent solution to this problem.

Third, people building a career should have a healthy stable sleep for achieving the goals in their careerists.

## 3. Conclusion

A person understands the importance of healthy and stable sleep for achieving high professional effectiveness, as well as for building a happy family life. As a result of a survey on the use of trackers to improve sleep quality, it is found that 16% of respondents try sleep trackers and are ready to explore their sleep with other applications, 34% of respondents plan to try sleep trackers, 35% of respondents are undecided, and 15 % of respondents refuse to use gadgets.

In conclusion, it should be noted that the population of the planet is growing. Since 1960, the world's population has increased by 4 billion people, and by 2024 it should exceed the boundary of 8 billion people. Moreover, as the figures show, the number of jobs will not increase proportionally, the robotics market will grow; it means that a large number of companies will try to reduce the influence of the human factor on certain processes. Thus, the requirements for workers will grow, and the quality of sleep will become one of the factors of high efficiency and a happy life in the modern world.

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