

Enhancing Health Information Management with Smart Rings

Bhavishya. B. Ramchandani

Student, Atlas skill tech university

Abstract

A little electronic device that is worn on the finger is called a smart ring. It incorporates mobile technology and has features that make it simple to use the device. These gadgets, which resemble conventional rings and are usually made to fit on the finger, are outfitted with features including access management, gesture control, mobile payment processing, and activity tracking. A poor sleep pattern, an irregular schedule, and bad eating habits are all part of the problems with health that a lot of people today are facing. Diets lacking of fruits, vegetables, legumes, nuts, and whole grains are common. Individuals in India also experience metabolic issues. In the medical field, smart rings will help patients with problems relating to stomach illnesses and the incapacity to consume meals that are tailored to their bodies' needs. The smart ring tracks all bodily functions, including blood sugar and glucose levels, and presents the information instantly. Based on this data, the ring generates what the body will find to be perfect insights and a workable site layout. In addition, we conducted focus groups and individual interviews as part of our core approach and discussing the difficulties they're having maintaining up the right diet, as well as whether or not the smart ring will be beneficial to them. However, everyone was very enthusiastic about and supportive of the concept of using smart rings in healthcare, and they believed that these rings may assist them in maintaining their health and have a well-balanced diet plan. This response came from the primary data and also working on the Emerging Technology Canvas Analysis of smart rings in healthcare has led to a significant improvement in our understanding of the technology's application in the medical field. It is believed that there will be a growing demand for smart health care as people become more conscious of their health. The majority of individuals will finally utilize this ring after three to four years, when demand for it will have increased. Their daily lives will be significantly impacted by it.

Keywords: healthcare, smartring ,Healthcare Technology, Innovative Health Device, Wearable Devices and Personalized Health

1 Introduction

Even the simplest technological innovations have a big influence, and smart technology is only getting smarter. Take smart rings as an illustration. They are the newest accessory to receive a smart technology makeover, offering options for contactless payments as well as features for tracking your health and sleep. The market for them ultimately opened up in 2013 with the launch of the first smart ring by the British IT company McLearn. As their name implies, these devices are shaped like old-fashioned rings but include modern chipsets, motors, and other helpful components like NFC, proximity sensors, motion sensors, and more. In essence, these are ring-shaped computers that can wirelessly do a number of tasks while

connected to your laptop and smartphone. ('Smart Ring', 2023) The bulk of the rings are water- and scratch-resistant, allowing them to capture data even while engaging in aquatic activities. Movano Health, Motiv Ring, Circular, and Oura are a few of the popular brands. Data Collected (sleep, Stress, Activity And Fitness, Viral, Illness, And Immune System Assessment, Period Predictor (*Motiv Ring | 24/7 Smart Ring | Fitness + Sleep Tracking Motiv Ring*, n.d.; *Oura Ring. Smart Ring for Fitness, Stress, Sleep & Health.*, n.d.; *SCR*, n.d.)

What are smart rings? In the ever-advancing landscape of wearable technology, smart rings are carving out a remarkable niche within the healthcare sector. These inconspicuous yet incredibly complex devices are a new technological force that have the potential to change the fundamental foundation of how we approach healthcare and wellness monitoring. They provide a remarkable fusion of design and usefulness while subtly residing on a finger, offering a sophisticated response to the age-old problem of smoothly integrating technology into our life. It is plainly obvious as we look into the future that smart rings are poised to transform the healthcare industry, ushering in an era of preventive and proactive treatment that holds the promise of improved wellbeing for everybody. Smart rings are the perfect example of wearable technology as it should be: small, pleasant, and seamlessly incorporated into daily life. They also have an unobtrusive form factor. They invite us to rethink the limits of healthcare management as they are embraced on a finger. Their potential genuinely shines within this delicate balance of restraint and creativity. The smart ring's amazing versatility, which offers a wide range of capabilities with the potential to transform healthcare management which is at the heart of its attractiveness. Nowadays there are many technologies in the market which are helping the health care sector. A few of them are really good for keeping a proper track on your diet plan. Like Ultra human M1 This helps to Discover your Metabolic Fitness which also provides Actionable Insights of your body. increase metabolic fitness by utilizing real-time insights. Boost your capacity to burn fat, lower oxidative stress, and boost energy.

Another feature: A glucose meter: The Continuous Glucose Sensor uses an NFC scan to sync with the Ultrahuman app and records your glucose levels in real-time. So this was one of my inspiration from an existing technology. Other technology is Ultra human ring air 1: This is a smart ring which has features which will help to improve your health like "Wake up to your insights about sleep" The Sleep Index evaluates your total sleep duration, resting heart rate, and restfulness to provide a complete picture of your sleep quality. It is cleverly designed to be your only metric for sleep health" Monitoring of temperature - The measurement of your skin temperature is essential for determining your body's physiological states and reactions to a range of stimuli, such as illness, stress, and exercise (*Ultrahuman | Pricing*, n.d.; *Ultrahuman Ring | Pricing*, n.d.; *What Is a Smart Ring and How Exactly Does It Work?*, 2023)

Boat also introduced its first smart ring to the market a few days ago. As a result, they have entered the healthcare market for smart rings. A few features related to healthcare are also available, such as menstrual tracking, heart rate monitoring, sleep tracking, body temperature monitoring, SpO2 monitoring, and body recovery tracking. These are the smart ring's health-related features, which can assist in resolving a few people's issues. (*Boat Smart Ring | Smart Ring with Smart Activity Tracking, Heart Rate Monitoring, Smart Touch Control, Smart Charging*, n.d.)

Explore the revolutionary possibilities of smart rings in the field of healthcare in this case study. The principal aim of this study is to investigate how the implementation of this novel technology can effectively tackle the problem of irregular meal planning, thereby reducing health issues associated with unhealthy food choices and fluctuations in nutrient consumption. Through the use of a smart ring,

consumers can obtain real-time, customized meal plans based on their own health needs. These plans include elements like fat content, sugar levels, glucose monitoring, and calorie intake. The all-encompassing strategy of the smart ring assists people in making data-driven, well-informed dietary decisions that match their individual health requirements. This in turn has the potential to improve lifestyle management, lower the risk of chronic diseases, and improve general health and well-being. The study delves into the diverse facets of adoption, obstacles, and prospects presented by this technology as it advances healthcare. In conclusion, the case study highlights the innovative opportunities that smart rings bring to the healthcare industry, stressing how they can transform meal planning, a health meal, and enable people to take charge of their own health. In order to complete our main research, we spoke with several stakeholders through interviews. It enabled us to obtain more precise data and determine how well individuals understood this technology.

2 Problem statement

People these days don't have a suitable diet plan for their bodies. It eventually might cause an issue. People don't really think about their diet and have a suitable diet plan, which is bad because a poor diet can lead to many health problems in the long term. This poor diet plan may further worsen the problem of vitamin, B12, and other deficiency issues that arise from the fact that many people don't even know what foods are healthy for them. (Ankar & Kumar, 2023)

Another issue is that, although there are smart watches available that can solve the issue of programming a diet plan and everything else, many people dislike wearing smartwatches since they think they don't seem stylish and sophisticated. On the other side, it's also highly costly. Additionally, there are watch enthusiasts who prefer to wear classic watches and switch them up based on their occasion. In that case, the smart watch created a problem. Another issue with smart watches is that they require daily charging. It might cause issues for a select few folks.

Therefore, technology that will aid in maintaining an effective strategy should be developed. based on the state of the body at the time. This can assist people in learning what foods are healthy for their bodies and which are not. In addition to this, it can support the maintenance of a record for great metabolism, which can lessen health problems brought on by poor digestion.

The lack of a proper schedule, an improper sleep cycle, and improper food habits all are contributing factors to the health issues that many individuals today are experiencing. 42 percent is the average for the world. Fruits, vegetables, legumes, nuts, and whole grains are often absent from the diet of the average Indian person. The association between chronic metabolic syndrome and Indians. In India, 43% of those with a normal body mass index have metabolic problems. This indicates that a sizable percentage of the population believes they are not obese or unwell because they are living in an illusion of security. Dr. Aseem lectured extensively on metabolic syndrome and how 1 in 3 adults in India have the condition. He used these five criteria to define metabolic health: (Prasad et al., 2012)

The ideal blood pressure should be ideally less than 120 over 80 mm Hg. it should not have pre-diabetes or type 2 diabetes. So on this basis. it's very important to work on these things. As a result, the issue of keeping track of what someone eats every day can be resolved by ensuring that they are eating well. To monitor their blood sugar and calories based on it. A smart patch known as the Ultra Ultrahuman M1 is available on the market; all you have to do is apply it to your body to monitor your intake of iron, calories and steps taken. Once you have all of this information, your patch will help you identify any issues with

your diet and current physical state by giving you a comprehensive site plan which can assist you in balancing it or finding a solution. (*Ultrahuman / Pricing*, n.d.)

3 Solution

How does a smart ring work?

Like any other smart gadget, smart rings are a miniaturized computer containing a processor, motors, sensors, and other components. Each of these is precisely inserted inside a ring. The sensors and processors they include are quite powerful despite their small frames. A smart ring can gather data using sensors, but in order to communicate the data and create a report from it, it must be connected to a smartphone or computer. With the help of its sensors, you can keep an eye on your workouts, running, stress levels, sleep, and more. However, as was already mentioned, if you connected it with them through Bluetooth or NFC, they can also control other gadgets. Thanks to NFC, smart rings may now accept payments using data updated by a smartphone app.

When you receive a call or a notification, some smart rings also have haptic signals that can vibrate to inform you even when the device is not immediately next to you (DO, 2022)

There are numerous minor issues in the healthcare industry that can have a significant effect on an individual, such as inadequate sleep or a poor dietary regimen. So solving a few issues like these, like as a healthy eating plan and a good sleep cycle, can make a significant difference in someone's life. and a smart ring is a tool that may improve your physical appearance and keep good track on your health.

What is a Smart Ring in Healthcare?

In the field of healthcare, a smart ring is a wearable gadget created to track and enhance a person's health and wellbeing. It uses a variety of sensors and technology to gather information on the user's body and health characteristics, including the number of calories they ingest, their blood sugar and glucose levels, and the amount of fat they consume.

How Does It Work?

A person's general well-being can frequently be greatly impacted by seemingly insignificant problems in the complex field of healthcare. Issues like poor sleep, unpredictable eating patterns, and erratic schedules may seem trivial at first, but they can eventually become serious health risks. Therefore, making significant improvements to one's quality of life can result from addressing these seemingly insignificant issues, like creating a nutritious meal plan and keeping to a regular sleep schedule. Presenting the smart ring—a wonderful gadget that can improve one's look while acting as a watchful health gauge. These subtle yet effective wearables are designed to give consumers insightful information about their lifestyle and health. Smart rings provide real-time feedback and personalized guidance on a range of health parameters, such as sugar levels, sleep patterns, and calorie intake, by utilizing advanced sensors and data analysis. In this situation, a smart ring goes beyond the stereotype of a straightforward accessory to take on the role of an active partner in the pursuit of improved health. This technology can potentially prevent the negative effects of unhealthy living by promoting healthier habits in addition to elevating aesthetics. The smart ring stands at the intersection of appearance, health, and well-being, transforming users' lives through its ability to promote regular and restorative sleep patterns or to help users make educated dietary choices. All things considered, the smart ring is a sophisticated way to solve issues with appearance and health. It is a marriage of form and function. Its many features have the capacity to provide users with the information and inspiration they need to make significant and long-lasting changes in their lives.

The Power of Data-Driven Insights The SmartRing stands out due to its ability to transform data into insightful knowledge. By accumulating and analyzing various data on your daily activities, sleeping patterns, and blood glucose levels, it develops into your personal health counselor. It provides tailored guidance to help you design dietary regimens and lifestyle choices best suited to your unique needs and objectives. Imagine receiving a notification advising you to modify your carbohydrate intake based on your blood sugar levels or a reminder to increase your daily walking distance in order to meet your fitness goals. These data-driven insights are both instructive and empowering, pointing you in the direction of better health. With the SmartRing's capabilities, you're not just tracking your health — you're taking control of it.

1. How Does It Aid?

Smart rings in the medical field have various advantages:

- 1 Personalized Meal Plans: The smart ring can create personalized meal plans that are catered to the user's particular needs by analyzing the user's health data.
- 2 Real-time Monitoring: Users have the ability to keep track of their calorie consumption, blood sugar, glucose, and fat intake in real-time, which enables them to make educated dietary decisions.
- 3 Health Monitoring: These rings can monitor a person's general health and offer information on how well they are doing with regard to their health objectives.
- 4 Tips and Recommendations: The wearer of the smart ring can receive tips and suggestions to help them adopt healthier eating and lifestyle patterns.

Why Would Users Use It?

The following factors will encourage people to utilize smart rings in healthcare:

- 1 Convenience: It provides an easy way to monitor and manage their health without requiring extra equipment or laborious manual record-keeping.
- 2 Personalization: The tailored meal plans and advice make it simpler for people to reach their health objectives.
- 3 Preventive Health: By encouraging preventive activities and helping to identify health problems early, it can help lower the risk of developing chronic diseases.

Users can base decisions about their food and lifestyle on current data to make data-driven decisions. (*9 Common Digestive Conditions From Top to Bottom*, n.d.; DO, 2022)

How Does This Solution Fit in?

For a number of reasons, this method is extremely pertinent in the context of contemporary healthcare.

- 1 Growing health issues: It is critical to have readily available technologies for health monitoring and management given the global rise in disorders linked to lifestyle, such as obesity and diabetes.
- 2 Personalized healthcare: Individualized diet programmes and health advice fit well with the expanding trend towards personalized treatment.
- 3 Wearable Technology: Smart rings provide a covert and fashionable method to include health monitoring into daily life. Wearable technology has grown in popularity.
- 4 Remote healthcare: In the era of telemedicine, smart rings that enable remote monitoring and data sharing can improve the accessibility and effectiveness of healthcare. (Ofer et al., 2019)

How it can be made

This revolutionary smart ring combines the attributes of glucose monitors, sleep trackers, and fitness trackers into a single, stylish wearable. It is inspired by a number of existing technologies. The SmartRing was developed to assist individuals in choosing actions that would enhance their health and wellbeing. It achieves this by empowering customers to construct customized meal and lifestyle plans using data-driven insights.

The scope of smart rings in the healthcare sector is vast and continually expanding as technology advances. Here are some key areas where smart rings are expected to have a significant scope and impact

- **Early Disease Detection:** Smart rings equipped with advanced sensors have the potential to detect early signs of various diseases, including chronic conditions like diabetes, cardiovascular diseases, and even certain cancers. They can monitor specific biomarkers, helping individuals and healthcare professionals intervene at an earlier, more treatable stage.
- **Hydration Monitoring:** Maintaining proper hydration is crucial for overall health. Smart rings can help individuals track their water intake throughout the day, promoting better hydration habits. *(Apple Watch Series 9 - Apple, n.d.; Bonatra XI Smart Ring, n.d.; The Best Smart Rings of 2023 | ZDNET, n.d.)*

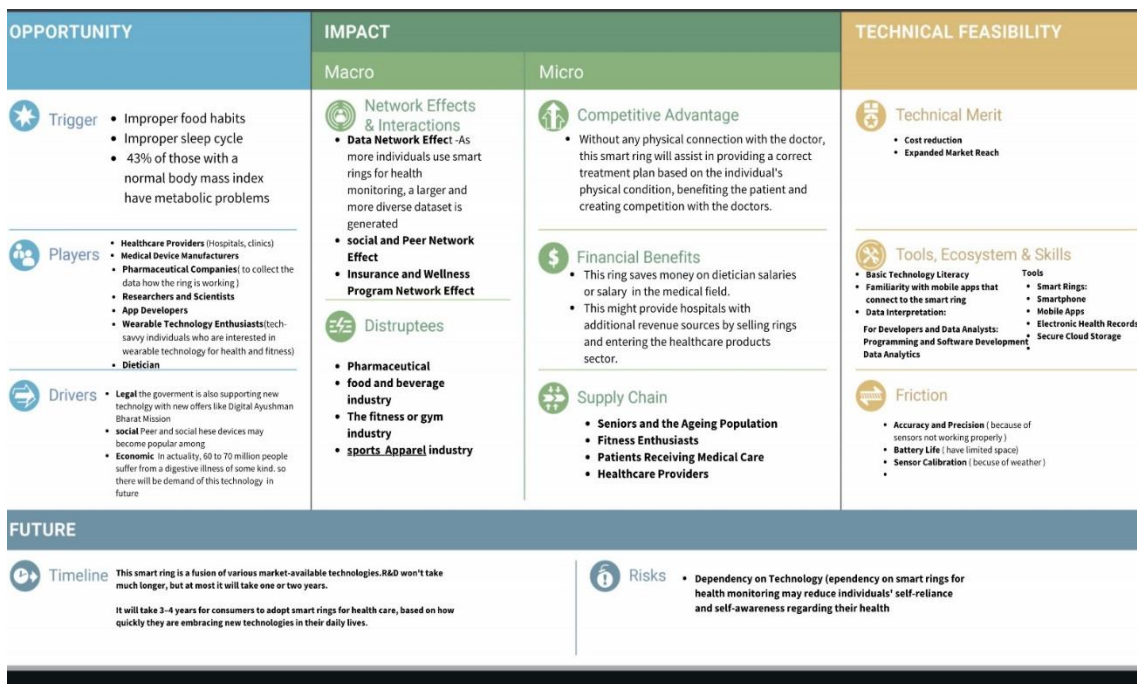


Fig 1 Emerging technology analysis canvas of Smart Ring in Healthcare Industry

The Emerging Technology Analysis Canvas

The Emerging Technology Analysis Canvas (ETAC). This canvas helps in providing a framework to analyze and forecast probable outcomes for developing technologies in a comprehensive and objective manner. Along with a visual narrative that links the questions to form a logical whole, it also includes questions that highlight various facets of an upcoming technology. Hence, keep technology in mind. ETAC canvas was made to support the smart ring in healthcare. Trigger: The problem and the solution are called the trigger in simple terms. That sparked a larger imagination and eventually gave rise to a broader technology promising to address bigger problems. The organization and the user who are actively using or upgrading the technology are also considered

players. The problems with people are related to health care in this canvas. Inappropriate eating habits, an erratic sleep schedule, and failure to receive the proper diet for a particular body type.

Improper sleep cycle: Your general health and well-being may be significantly impacted by an irregular sleep cycle and a lack of regular, high-quality sleep. Your body's natural clock might be thrown off if you have inconsistent sleep patterns, which can result in problems including exhaustion, mood swings, and impaired cognitive function. The importance of these sleep disturbances in healthcare is highlighted by the fact that they can also set off alarms on health monitoring equipment like smart rings. Inadequate sleep is also directly linked to physiological changes that take place during rest, like muscle relaxation and tissue repair. These vital functions can be hampered by an irregular sleep schedule, potentially worsening any existing health issues. Dietary decisions are essential in addition to getting enough sleep.

Not having a proper diet plan: For many people, choosing the wrong diet is a serious challenge, mostly because they are unsure of their protein and calorie requirements. Serious long-term health problems may result from the uncertainty surrounding whether to increase caloric intake or correct protein shortages. Inadequate protein consumption combined with an excessive calorie intake can lead to weight gain and the emergence of obesity-related health issues like heart disease, diabetes, and joint difficulties. In contrast, a lack of protein can cause weariness, a reduced immune system, and muscle weakness. A poor diet can have negative effects on mental health in addition to physical ones, including changes in energy levels, instability of mood, and deterioration of cognitive function. These problems may eventually lead to lower production and a lower standard of living.

Players : The ETAC (Emerging Technology for Advancing Healthcare) canvas is shaped by players, which include a wide spectrum of stakeholders. These people and organizations are at the forefront of utilizing technology to transform healthcare

operations and deal with pressing concerns. Healthcare providers, who use cutting-edge technology to improve patient care and streamline operations, are some of the important stakeholders. Pharmaceutical businesses use technology to research and create new treatments and therapies, while medical device makers play a key role in creating cutting-edge medical equipment. Researchers and scientists use cutting-edge technology to advance medical research and scientific understanding. By creating healthcare-related apps that enable users to successfully manage their health, app developers make a contribution. Wearable technology enthusiasts actively engage with and accept these advances because they are passionate about tech-driven health and fitness solutions. Additionally, the adoption of wearable technology is being fueled in large part by tech-savvy people who have a strong interest in it for uses related to health and fitness. Last but not least, dietitians make use of cutting-edge technologies to improve dietary advice and support for healthier living. These players work together and contribute to the constantly changing world of healthcare technology, encouraging developments that benefit all of us. Healthcare Providers (Hospitals, clinics), Medical Device Manufacturers, Pharmaceutical Companies, Researchers and Scientists, App Developers, Wearable Technology Enthusiasts and Dietician this all are the main players of this technology”

Drivers

Legal

The government is now developing a number of new offers to help the Indian economy and expand its industry. Similar to how the Indian government has new policies that will support new technology in order to boost the healthcare industry. Digital Ayushman Bharat Mission (The government is also paving the

ground for the modernization and digitalization of India's healthcare system. The Ayushman Bharat Digital Mission (ABDM) is one of the initiatives taken by the government to promote healthcare technology and is a step in the right direction for building a digital backbone for the Indian Healthcare (*Digital Technology Can Help India Transform Public Healthcare | Mint, n.d.*)

Economic

inexpensive modification. This intelligent ring will also revolutionize the economy. Because of this technology, the future may be here. Though most individuals avoid discussing it, stomach issues are more typical than you might realize. In actuality, 60 to 70 million people suffer from a digestive illness of some kind. Therefore, this technology will advance as the ring helps in providing people with a suitable food plan according to their body types. Because people are gradually beginning to place more significance on their health. As a result, there may be a high demand for this smart ring in the healthcare industry in the future. (*9 Common Digestive Conditions From Top to Bottom, n.d.*) (*What Is Wrong with the Indian Diet? Apparently a Lot, Claims UK-Based Cardiologist Dr Aseem Malhotra - Times of India, n.d.*)

Social

Peer and social network effects: are another factor that smart rings can use. These devices may become popular among members of a social group or community, which may create a beneficial feedback loop. It's possible that similar technology will drive

Friends, family members, or coworkers use it as well, creating a sense of competitiveness, inspiration, or mutual support for reaching fitness and health goals. This social component may encourage more participation and adherence in health monitoring practices, which will ultimately lead to better overall health outcomes.

Impact It's critical to stress that the evaluation of influence goes beyond the existing technology landscape and considers potential for the future. There are two major categories of influence to take into account within the ETAC framework: macro and micro. The broader effects of technology on a worldwide scale are referred to as macro impact. Micro impact, on the other hand, focuses on the particular consequences felt by specific organizations within the supply chain

Macro impact

A technology has a network effect : if growing adoption increases the value of the technology for current users, resulting in a positive feedback loop.

Data Network Effect: A bigger and more varied dataset is produced when more people accept and use smart rings for health monitoring. Vital health indicators including heart rate, sleep habits, exercise levels, and more are included in this data. This dataset gets increasingly valuable for researchers and healthcare practitioners as more people

contribute to it. Predictive analytics can be used to identify health trends, prospective problems, and tailored suggestions with a bigger and more diverse pool of data. The total efficiency of smart rings in giving useful health information is increased by this data network impact.

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Network Effect between Insurance Companies and Wellness Programmes: Insurance companies and wellness programmes are becoming more and more engaged in encouraging healthy behaviors among their members. By providing users with incentives to live healthier lives, smart rings can help with this. A network effect occurs when wellness programmes or insurance companies provide discounts, rewards, or other advantages to those who wear smart rings to monitor their health and share their data. As more users are encouraged to engage, smart rings as a tool for preventative healthcare are more widely adopted. In turn, this helps the organizations providing the incentives as well as the consumers by perhaps lowering healthcare costs through early intervention and healthier lifestyles.

Disruptive: Technology or industries that will be disrupted as a result of this new technology may also experience positive and beneficial effects. For this technology the Disruptees will be pharmaceutical industry, food and beverage industry, The fitness or gym industry, sports Apparel industry. So because of the smart ring into health care this industry can be affected positively or negative.

Micro impact

Competitive advantage: Without any physical connection with the doctor, this smart ring will assist in providing a correct treatment plan based on the individual's physical condition, benefiting the patient and creating competition with the doctors.

Financial benefit: This ring cuts the cost of dietician salaries. By selling rings and entering the healthcare products market, this might give hospitals new streams of income.

Supply chain: It is very important in everything, including this technology. The smart ring of healthcare needs a strong supply chain. Its supply chain has all this

“Raw Materials and Components Suppliers, Manufacturing and Assembly, Warehousing and Distribution, Packaging and Labeling, Data Management and Analytics, Sales and Marketing, Service and Support”

Seniors and the Ageing Population: Older adults who want to keep their independence and keep an eye on their health, particularly those who have age-related health issues.

Fitness Enthusiasts: Smart rings can be used by athletes, fitness enthusiasts, and people who participate in regular physical activity to monitor their performance, recovery and general health.

Patients Receiving Medical Care: People receiving medical attention from healthcare professionals who may be given smart rings as a recommendation or prescription for ongoing monitoring and data collection.

Healthcare Providers: Doctors, nurses and other healthcare experts who use smart ring data to remotely manage and check on the health of their patients.

For a complete picture of a patient's health, healthcare facilities and hospitals may incorporate smart ring data into their electronic health records (EHR) systems.

Feasibility - In ETAC, feasibility assesses the promise's likely technical viability. In other words, is the promise likely to be fulfilled even if it is physically possible? Three things are included in this.

Technical merit- Technical merit requires determining the advantages and disadvantages of the modified architecture. The way the modification would help meet the performance requirements and architectural

guidelines should be covered in these technical merits. Now, with a keen eye, the technical merit can be..(What Are the Technical Disadvantages of Smart Ring - Google Search, n.d.)t

Here are a few technical merits of the smart ring.

Display: To view data, they require a connected device as they do not have screens.

Storage: The processing and storage of rings is dependent on a pair of devices. (Leo, 2022)
Risk factors in security While smart rings are unquestionably dependable and safe to use for data transfer and managing other digital devices, security flaws are still a possibility. It is hackable as well.

Cost reduction: Smart rings can help healthcare providers cut back on the price of managing chronic diseases, avoiding readmissions to the hospital and providing emergency care. Cost reductions and more effective healthcare delivery may result from this.

Expanded Market Reach: The use of this technology may allow businesses to enter new markets and seize new possibilities. They can expand their market reach into the wellness, fitness, and lifestyle sectors in addition to traditional healthcare

Tool, ecosystem and skill: To use this technology we need some skills and tools. This are the technology 1 Basic Technology Literacy 2 Familiarity with mobile apps that connect to the smart ring 3 Data Interpretation For Developers 4 Data Analysts Programming and 5 Software Development 6 Data Analytics. This are the skills which is required to use this technology Smart Rings: 1 Smartphone 2 Mobile Apps 3 Electronic Health Records 4 Secure Cloud Storage

Friction: Friction is a technical issue that may arise while implementing this technology. Since it's technology, there may be a few technical problems, such as accuracy and precision (caused by malfunctioning sensors). Battery life (have a small footprint) calibration of sensors due to weather

Timeline: What are the major potential turning points in the development of technology? How long, for instance, will it take for the fundamental technology to be developed? How quickly will adoption occur? The creation of this cutting-edge smart ring symbolizes a seamless fusion of various easily available marketable technologies. It is anticipated that the research and development phase for this cutting-edge equipment will be completed over the next few months to a year or two, at the most. The path from conception to widespread consumer adoption, however, is a complex one. The adoption of smart rings for healthcare is predicted to take between three and four years, given the rate at which people generally incorporate new technology into their daily lives. This slow adoption is a reflection of the demand for user education, the maturation of the industry and the development of consumer confidence in the capacities and advantages of these devices, establishing them as important instruments for managing personal health. (1-2 years in RND) (3-5 years to create a demand and people start using it)

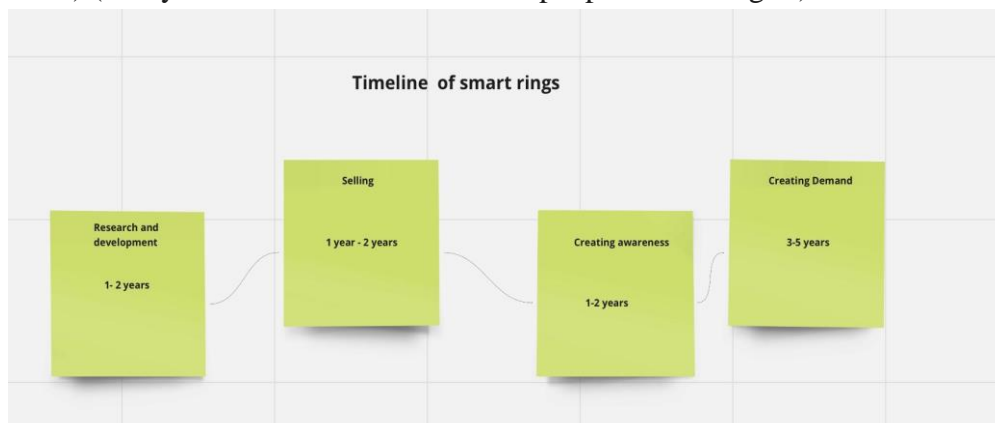


Fig 2 timeline for smart ring

Risk: What are the potential risks of implementing this technology?

Dependence on Technology (a person's reliance on smart rings for health monitoring may decrease their sense of independence and self-awareness)

Security and privacy issues Security and privacy issues:

Concerns about data privacy may arise when personal health information is gathered and stored. Users are concerned about the handling of their data, who has access to it, and whether it will be used improperly.

Data security: Smart rings are susceptible to hacking and data breaches, which could reveal private medical data.

The synopsis also discusses how technology has made things easier to understand, such as whether technology will endure or whether people will use it. It displays the growth of technology in the future. It also displays the technological glitches in the system. It discusses players as well. While considering other ETAC components, the summary section addresses potential technological development and deployment scenarios. We talked about drivers in the section on opportunities. We examine the technology's potential and technical reality in the sections on impact and feasibility. Risks and prospective major turning points are covered in the future section. To comprehend possible scenarios and related likelihoods, the summary section examines the conflict between the technology's potential and the environment in which it must function.

This paragraph focuses on the primary study undertaking, including how we accomplished it and the methods we used to obtain the data. What are the techniques we employed, what were the outcomes, and what insights did we gain?

Methodology

To acquire high-quality data, we employed a variety of techniques, including research forms and conducted interviews. We asked different questions to help people who knew better grasp this technology. It was also clear from this study whether or not people would accept this technology. Students were our main target demographic for this, especially those who were learning remotely, and those in the employment ranged in age from 18 to 25. We spoke with a doctor to get more about their perspectives and feelings on the technology and the ring. In order to gain a deeper understanding, we spoke with students who have hectic schedules and don't always have a healthy dinner, and asked about their impression of the technology, as well as whether the ring will help them keep their eating habits and preserve excellent health. In all, we conducted 3 interviews and collected 30 survey responses to obtain this primary study data.

Solution

After carrying out all of the research and utilizing as many different approaches as possible, answers gained some new perspectives and potential solutions. In this regard, for instance, fifty-two percent of respondents believe that wearing a smartwatch can assist them in leading a healthier lifestyle. Forty-one percent of people use fitness applications. There are still some individuals who have expressed a wish to alter their way of life, but they are unable to do so for a variety of reasons. It is estimated that 47.1% of individuals are able to spend money on a smart ring in order to improve their health.

Conclusion

As a direct result of the task that you delegated to me, my knowledge regarding the various ways in which smart rings might be utilized in the medical industry has been significantly expanded. Can we accurately

predict how far technological development will progress in the years to come? When do you think it will become popular among the general population, assuming that this is the case?

We believe that it will take the general public three to four years to become accustomed to this new technology, but that in the long run, the vast majority of people will start wearing this ring. In a few years, when people have come to the realization that it is essential for them to take care of themselves, they will prioritize their health and the vast majority of them will be wearing this ring.

The ETAC canvas was also helpful in assisting me to anticipate some of the potential technical challenges that may arise while making use of this apparatus. concerns, such as data leaks and other problems, and it assisted me in determining which areas of the healthcare industry will be most significantly impacted by the implementation of this smart ring technology.

After finishing this task, I was able to gain some perspective on the situation. Through the process of developing the ETCA tag, I gained a lot of knowledge about the role that the smart ring plays in the healthcare system. As people become more aware of their health, we anticipate that there will be an increase in demand for cutting-edge medical procedures. The vast majority of people will be using this ring within the next three to four years, and its popularity will skyrocket as a result. Their regularly scheduled activities will be significantly disrupted.

Overall, primary research was beneficial for this topic since it let us understand people's individual points of view, which is a crucial understanding. Although it took a while, the procedure was quite beneficial and we learned a few things that improved our comprehension of smart rings.

References

1. *9 Common Digestive Conditions From Top to Bottom*. (n.d.). Retrieved 23 October 2023, from <https://www.everydayhealth.com/digestive-health/common-digestive-conditions-from-top-bottom/>
2. Ankar, A., & Kumar, A. (2023). Vitamin B12 Deficiency. In *StatPearls*. StatPearls Publishing. <http://www.ncbi.nlm.nih.gov/books/NBK441923/>
3. *Apple Watch Series 9—Apple*. (n.d.). Retrieved 23 October 2023, from <https://www.apple.com/apple-watch-series-9/>
4. *boAt Smart Ring | Smart Ring with Smart Activity Tracking, Heart Rate Monitoring, Smart Touch Control, Smart Charging*. (n.d.). boAt Lifestyle. Retrieved 24 October 2023, from <https://www.boat-lifestyle.com/products/boat-smart-ring>
5. *Bonatra X1 Smart Ring*. (n.d.). Retrieved 23 October 2023, from https://www.bonatra.com/ring/bonatra-x1-ring-hhmhd?Colour=Stardust+Silver&Charging=Wired&Size=&utm_source=Google_Ads&utm_medium=Smart_Ring_Sale-Search_Campaign&gclid=CjwKCAjwjaWoBhAmEiwAXz8DBfMi4oV15jMN2IH6MXz2Ok1SP0TtOEFESe4UpwO07daKtSmCBNBdJxoCmBEQAvD_Bw
6. *Digital technology can help India transform public healthcare | Mint*. (n.d.). Retrieved 23 October 2023, from <https://www.livemint.com/opinion/online-views/digital-technology-can-help-india-transform-public-healthcare-11683857820472.html>
7. DO, B. W. (2022, December 2). Move Over Smartwatch—The Wearable Ring Geared To Keep You Healthy. *TravelAwaits*. <https://www.travelawaits.com/2837056/what-are-smart-rings-how-do-they-work/>
8. Leo, F. (2022, April 9). *Pros And Cons Of Using Smart Rings In 2023*. <https://gorilla->

- fitnesswatches.com/pros-and-cons-of-using-smart-rings/
9. *Motiv Ring | 24/7 Smart Ring | Fitness + Sleep Tracking Motiv Ring.* (n.d.). Retrieved 31 October 2023, from <https://www.mymotiv.com/>
 10. Ofer, K., Ronit, L., Ophir, A., & Amir, K. (2019). Normal body mass index (BMI) can rule out metabolic syndrome. *Medicine*, 98(9), e14712. <https://doi.org/10.1097/MD.00000000000014712>
 11. *Oura Ring. Smart Ring for Fitness, Stress, Sleep & Health.* (n.d.). Oura Ring. Retrieved 31 October 2023, from <https://ouraring.com>
 12. Prasad, D. S., Kabir, Z., Dash, A. K., & Das, B. C. (2012). Prevalence and risk factors for metabolic syndrome in Asian Indians: A community study from urban Eastern India. *Journal of Cardiovascular Disease Research*, 3(3), 204–211. <https://doi.org/10.4103/0975-3583.98895>
 13. SCR. (n.d.). *Homepage—Movano Health.* Movano. Retrieved 31 October 2023, from <https://movanohealth.com/>
 14. Smart ring. (2023). In *Wikipedia.* https://en.wikipedia.org/w/index.php?title=Smart_ring&oldid=1182145704
 15. *The best smart rings of 2023 | ZDNET.* (n.d.). Retrieved 23 October 2023, from <https://www.zdnet.com/article/best-smart-ring/>
 16. *Ultrahuman | Pricing.* (n.d.). Retrieved 23 October 2023, from <https://ultrahuman.com//pricing/in?product=uh-m1-twelve-week>
 17. *Ultrahuman Ring | Pricing.* (n.d.). Retrieved 23 October 2023, from <https://ultrahuman.com//ring/buy/in>
 18. *what are the technical disadvantages of smart ring—Google Search.* (n.d.). Retrieved 24 October 2023, from https://www.google.com/search?q=what+are+the+technical+disadvantages+of+smart+ring&client=safari&sca_esv=576092567&bih=840&biw=1470&hl=en&ei=WbM3Zeq4LeH1juMP1bKg6A0&oq=what+are+the+technical+disadvantages+of%2%A0&gs_lp=Egxnd3Mtd2l6LXNlcnAaAhgCil3aGF0IGFyZSB0aGUgdGVjaG5pY2FsIGRpc2FkdMfudGFmZXMgb2bCoCoCCAAYBRAhGKABMggQIRgWGB4YHTIIECEYFhgeGB0yCBAhGBYYHhgdMggQIRgWGB4YHTIIECEYFhgeGB0yCB AhGBYYHhgdMggQIRgWGB4YHTIIECEYFhgeGB0yCBAhGBYYHhgdSLe1AVCKLVjTmAFwA3gBkAEAmAH8AaAB7yuqAQYwLjMzLjS4AQPIAQD4AQGoAgrCAgoQABhHGNyEGLADwgIUEAAyigUY6gIYtAIYkQIYiwPYAQHCAhkQABgDGI8BGOUCGOoCGLQCGIwDGIsD2AECwgIfEC4YAXiPARjIAhjqAhi0AhiMAxiLAXiaAxioA9gBAsICBxAAGIoFGEPcAg4QABiKBRixAXiDARiRAsICDhAuGIoFGLLEDGIMBGJECwgILEC4YigUYsQMYgwHCAGgQABiKBRiRAsIC CxAAGIAEGLLEDGIMBwgINEAAyGAYsQMYgwEYCsICChAAGIAEGLLEDGARCAgUQABiA BMICCBAAAGIAEGLLEDwgIIEAAyigUYsQPCAggQABgWGB4YD8ICBhAAGBYHsICCBAA GIoFGIYDwgIHEAAyDRiABMICChAAGAgYHhgNGA_CAgUQABiiBMICCBAAAGAgYHhgN wgIGEAAyHhgN4gMEGAAgQYgGAZAGCLOGBAgBGAe6BgQIAhgK&client=gws-wiz-serp
 19. *What is a Smart Ring and how exactly does it work?* (2023, August 25). HT Tech. <https://tech.hindustantimes.com/wearables/news/what-is-a-smart-ring-and-how-exactly-does-it-work-71692953216181.html>
 20. *What is wrong with the Indian diet? Apparently a lot, claims UK-based cardiologist Dr Aseem Malhotra—Times of India.* (n.d.). Retrieved 23 October 2023, from <https://timesofindia.indiatimes.com/life-style/health-fitness/diet/what-is-wrong-with-the-indian-diet-apparently-a-lot-claims-uk-based-cardiologist-dr-aseem-malhotra/articleshow/75742419.cms>