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Shared Massage Chair Application in the Context of IoT: Take “Lemobar” as an Example

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Abstract. The increase in productivity brought about by every technological change in history will also profoundly affect and change people’s lifestyles and habits. The increasing maturity and wide application of the Internet of Things technology has brought unlimited possibilities for business. The further development of artificial intelligence will make big data integrated through the Internet of Things and create greater value. The “sharing economy” has deeply affected people’s lives in recent years and been widely reported and triggered by many scholars’ research. This paper explores the shared massage chair that is rarely studied from a technical point of view, compared to the popular shared bicycle, shared power bank, and takes Lemobar as an example, which is so far the benchmarking in the shared massage industry. This paper initially concludes the development process of shared massage that is changing with technological progress, and furthermore analyzes the shared massage application including software & hardware support, operation management, system integration and different kind of scenarios combination. The application of Lemobar is a remarkable case of human and machine interaction in the context of Internet of Things and big data.

Keywords. Internet of things; shared massage chair; Lemobar; artificial intelligence.

1. Introduction

The first industrial revolution that began in the 1860s, while creating enormous wealth for mankind, also greatly promoted social change. After the late 1860s, endless new technologies and new inventions further promoted economic and social development, and the second industrial revolution flourished. The information revolution that began in the middle of the 20th century also had a huge impact on mankind, and people’s ways of thinking and living habits also changed accordingly. Since the 21st century, the deployment of a large quantity of cyber physical systems has realized the integration of communication technology and sensors and other terminals, which not only accelerates the transformation of the economic development mode but also deeply affects the lives of more and more people. It is worth emphasizing that the strong connectivity of 5G will promote the flow of large amounts of data and information and generate value and promote the full implementation of new technologies such as artificial intelligence, Internet of Things, and cloud computing in various fields of the economy and society. There is no doubt that these technologies will create great value for human.

Around 2010, a new economic paradigm was evolving in some areas of the market economy, which may further reduce the marginal cost and bring it close to zero. This economic paradigm known as the “sharing economy” makes many goods and services nearly free. The emergence of this business model is mainly due to the progress of information and communication technology, especially the maturity of the Internet of Things technology has played an important role in promoting. While
enterprises and consumers are effectively connected through the Internet of Things, a large amount of data accumulated in the integrated system of the Internet of Things can play a key role in providing better services for consumers. Uber and AirBnb abroad have received great attention since their rise and have attracted many scholars to study. As far as the domestic situation is concerned, shared bicycles and shared power bank that started in 2016 have also attracted the attention and research of people from all walks of life. Most of the existing literatures are from business models, collaborative creation, trust mechanisms and sustainable development [1-5] to research, few literatures analyze them from the perspective of technological progress. On the other hand, the shared massage chair is rarely studied by scholars to some degree. Therefore, this paper selects the “Lemobar” shared massage chair, which ranks first in the domestic market share, as the research object.

2. The Development of Shared Massage Chair

2.1. Traditional Stage
In the early 1960s, Nichimu Inada, the father of massage chair in Japan, founded a company called FAMILYINADAINC and launched the first mechanical massage chair in the world. At that time, the massage chair had a single function, a poor experience, and the market developed slowly. In the 1980s, Japan produced a massage chair with a roller machine for up and down as a medical device, and began to expand the market to Hong Kong, Taiwan, South Korea, and other places. The massage appliance at this stage has achieved miniaturization and precise control. In the 1990s, Japan’s Omron, Fuji and Shouken launched a kind of luxury home massage chair. The market for home massage chair gradually became a promising industry, and gradually moved to North America and Europe and other developed regions. At the same time, some people with better economic conditions in mainland China began to try massage chair experiences in activity rooms and gyms. All in all, in terms of the domestic market, massage chair before the 21st century is in the traditional stage because the technology is not yet mature. One of the reasons for the low penetration rate is that the economic level has not yet improved.

2.2. Intelligentized Stage
After the 21st century, the functions of massage chair have been gradually enriched with the application of emerging technologies, which is shown in figure 1. Toyama, Sanyo, and Fuji have successively launched multi-functional intelligent massage chair, and the industrial chain has begun to shift to the domestic market. China has also developed some competitive massage chair companies, such as Rongtai and OGAWA.

![Figure 1. The changing process of massage chair with the progress of technology.](image)

With the rapid economic development and the continuous improvement of people’s living standards, health care has gradually become a new concept of life. Around 2010, some coin-operated shared massage chairs appeared in some public places such as hotels and airports in China, but it was difficult to form a large-scale because of the traditional coin payment method and the operation by someone on duty, which result in the frequency of use of the massage chair in public places was not high.
After 2015, with the rapid development of the mobile Internet, the number of smartphone owners is growing. It has also been accompanied by the rise of mobile payment technology. “First Class” as a brand that the earliest entry into the shared massage chair that can scan code payment, started testing the market in May 2016. The team of “First Class” had continued to invest millions of dollars in their own at that time. While continuing to promote the project, it has also attracted the attention of capital. In early 2017, First Class Internet Technology Co., Ltd. won 15 million angel investments from Zhenshun Fund, Plum Ventures and Defeng Capital.

There are three main reasons for the rise of the shared massage chair. From the perspective of most consumers, in the first place, at the current stage when people’s massage needs are fully tapped, the unit price of a common household massage chair is 10,000 to 30,000 Yuan, which is obviously a bit too expensive for most working-class people. Secondly, even if a customer buys a massage chair, but the housing prices in the city are still high, the customer must free up an area of 1 to 2 square meters to put the massage chair, which the implicit cost is clearly too high. Therefore, it will take a long time for most people to be able to use the ordinary massage chair, and the shared massage chair are undoubtedly the best choice when the service price is reasonable and the service quality is satisfactory to consumers. On the other hand, advances in technology not only enable convenient and fast mobile payments, but also make the quality of massage chair services increasingly recognized and loved by people. Driven by various factors, the development of the shared massage chair is rapid. But after the fierce competition in the market, Lemobar became the first brand in the domestic shared massage chair market share around 2019, whose more than 110,000 devices are laid in more than 450 cities in 32 provinces, autonomous regions and municipalities. Under the best operating conditions, it is worth emphasizing that more than 600,000 people use “Lemobar” shared massage chair every day, which benefits from the outstanding management of Lemobar.

3. The Top Brand of Shared Massage Chair: Lemobar

3.1. The Brief Introduction of Lemobar

Lemobar is a registered trademark held by Fujian Lemobar IoT Company Limited, whose vision is to integrate comfortable and professional massage services into fragmented waiting scenarios to let consumers can enjoy professional massage services at a lower cost. As the leader of commercial intelligent massage chair, Lemobar implements Internet of Things technology to realize the unattended operation of massage chair, and lay high-end massage chair in shopping malls, airports, high-speed rail stations, hotels, cinemas, and other scenes to meet the health and leisure needs of consumers. At the end of 2017, with its industry leading position and outstanding user experience and good reputation, Lemobar received the first round of financing of 50 million yuan from Cornerstone Capital. Lemobar is a company in the industry that can achieve the operation and maintenance effect in more than 400 cities within 6 hours. At present, the operation and maintenance service centers of provincial capitals and all economically developed cities have been fully established, which will form a comprehensive operation and maintenance service capacity for the national market.

3.2. The Application of the Internet of Things

The Internet of Things (IoT) was first introduced in 1999 by Kevin Ashton and it was defined as a group of smart objects connected via radio frequency identification technology [6]. The basic concept of the IoT is the widespread presence of a variety of things or objects - such as sensors, mobile phones, actuators, etc. - which, through unique addressing schemes, can interact with each other and cooperate with their neighbors to achieve a consistent purpose [7]. It is also a significant advancement in the Big Data era, which supports many real-time engineering applications through enhanced services [8]. Unquestionably, the greatest advantage of the IoT technology is the high impact it will have on some aspects of daily life and behavior of potential consumers [9]. Internet of Things envisions a future in which physical entities and digital can be linked, with the aid of advisable information and communication technologies, to enable a whole new class of applications and services
The rich functions of the shared massage chair as shown in figure 2 are largely due to the IoT technology.

![Figure 2. IoT-based functions of shared massage chair.](image)

To a certain extent, developing energy-efficient, delay-aware, and reliable route planning is one of the significant challenges in the scenarios of data aggregation for IoT applications [12]. However, the combination of sensors, artificial intelligence algorithms and the continuous networking status achieved by the wireless local area network technology makes the massage chair intelligent. The application of these technologies makes it possible to collect data, share data, analyze data, and feed back valuable information to customers.

The biggest difference between the shared massage chair and the ordinary massage chair is its control mode and use method. The ordinary massage chair uses the hand controller or the remote control to realize the command input and operation control, and the shared massage chair applies the Internet of Things technology to connect the massage chair with the server. After the customer pays by using WeChat or Alipay to scan the code, the server sends the start command and running time to the shared massage chair, which is the biggest difference from the ordinary massage chair. Secondly, in terms of the structural design and material quality of the massage chair, the requirements for the shared massage chair are stricter, because it is used by the public in the form of “sharing” in public places, and the frequency is obviously much higher than that at home. The last obvious one is the difference in usage scenarios. The ordinary massage chair is used in the home, and the shared massage chair is used in shopping malls, airports, train stations and other public places. So the latter can also generate some additional value, for example, compatible with charging the mobile phones, advertising, etc.

3.3. The Potential of Big Data

The application of the Internet of Things technology makes it possible to collect data from the shared massage chair. The development of data warehouse and online analytical processing have established the framework for business intelligence. In 1989, Howard Dresner of Gardner Consulting gave a formal definition of “business intelligence” in the business circles: “Business Intelligence” refers to a series of technologies and methods based on facts to support and assist business decision-making [13]. The data warehouse is a subject-oriented, integrated, non-volatile, time variant data collection, used to support decision-making in management. The biggest difference between data warehouse and database is that the former organizes and stores data for the purpose of data analysis and decision support, while
the main purpose of the database is to save and query data for operational systems [14]. Online analytical processing known as multi-dimensional analysis is intended to connect discrete databases for comprehensive analysis in multiple dimensions.

![Diagram of data processing flow](image)

**Figure 3.** Application principle of Internet of Things in shared massage chair.

But what really makes business intelligence truly generate value is its next step: data mining, which was once called “knowledge discovery in database”. The data collected by Lemobar in the process of providing massage services to consumers, including user personal information data and health data, can not only provide valuable information to consumers, but also provide researchers with relevant data when they are studying issues such as improving the health of citizens. At the same time, the explosion of big data makes people urgently need tools for displaying data, understanding data, and interpreting data. The existence of this demand directly stimulates the formation of a professional market for data visualization, which promotes the popularization of business intelligence by turning complex data into intuitive graphics and presenting it to the most common users. Lemobar has excellent performance at data visualization, which is conducive to the company’s operation management and creates more value for customers.

4. Opportunities and Challenges

4.1. The Opportunities of Shared Massage Chair

From the perspective of demand growth, the development prospect of the shared massage chair is considerable. In recent years, with the improvement of people’s economic level and quality of life, many people pay more and more attention to healthy lifestyles and personal health problems. For the elderly, massage can help bring them physical and mental health protection, which is conducive to their longevity. For young people, massage can help them achieve the purpose of relieving fatigue and
stress. And with the further development of technology and the standardized management of user data, it is possible to form a personal health management file by using the shared massage chair, which not only does not have the trouble of going to the hospital for medical examination, but also achieves the purpose of continuous detection and tracking of body health for consumers. From a larger perspective, the big health industry is bound to receive more and more attention.

In terms of technological progress, the massage chair will develop towards intelligentize. When artificial intelligence and the Internet of Things are jointly applied, the system can collect various types of information in real time through various information sensors in the context of monitoring and interaction, and intelligently analyze the data through machine learning in terminal devices, edge domains or cloud centers, including positioning, scheduling, forecasting, comparison, etc. At the technical level, artificial intelligence enables the Internet of Things to acquire perception and recognition capabilities while the Internet of Things provides artificial intelligence with data for training algorithms. At the commercial level, they work together in the emerging economies to promote industrial upgrading and experience optimization. The development needs of the shared massage chair coincide with the direction of technological progress.

Last but not least, the role of data may well exceed the imagination of its original collector, or it may exceed the purpose of its original information system design, that is, the same set of data can produce different values and utility in different dimensions. If data integrators can continuously discover and develop new dimensions of use, the potential value of data will be magnified.

4.2. The Challenges of Shared Massage Chair

Unprofitable business models will not be sustainable for any companies. The increase in the rental cost of the venue and the increase in the cost of the massage chair will become its biggest obstacle on the road to profitability. On the other hand, because the shared massage chair equipment is laid in public areas such as shopping malls, airports and railway stations, it is susceptible to weather and other factors, such as snow and ice weather in the north, typhoons and rainstorms in the south, etc. which will cause people to go out less to use the massage chair equipment in these public areas. In addition, although the resulting massive user data will bring value, the use of data still requires a standardized environment, otherwise it may cause unnecessary trouble to the enterprise. Big data has the potential to fundamentally transform society but unlocking this potential will require rigorous attention to data governance and insightful application of data analytics combined with an environment that spurs managerial innovation.

Although these existing challenges must be faced by enterprises, the future of the shared massage chair is still very exciting under the favorable environment of considerable development prospects and rapid technological progress.

5. Conclusion

Since the 21st century, with the further development of technologies such as the Internet of Things and artificial intelligence, many disruptive innovations have been brought to all walks of life, including business. As people’s habit of using shared massage chair is gradually cultivated, more and more intelligent shared massage chair will bring health protection to more ordinary people, and the resulting big data will also create for enterprises and consumers inestimable value. Even though there may be some difficulties and challenges in this process, with the development of technology and the specification for big data applications, these problems will be solved in the future.

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